Vegetation Sampling Reports for

USFS Cascabel Ranch Watershed Research

Study

2000, 2001, 2002

RMRS-98180-RJYA

Submitted by
Myles B. Traphagen
910 L Street
Davis, CA 95619
(520) 991-6368

Thesis/
Reports
Traphagen,
M. B.

Vegetation Sampling Reports for

USFS Cascabel Ranch Watershed Research

Study

2002

Submitted by
Myles B. Traphagen
910 L Street
Davis, CA 95619
(520) 991-6368

Introduction

During the month of November 2002, a third year of baseline vegetation data was collected at the Cascabel watershed research site. In 2002 further improvements were made to the project, notably the addition of steel tag markers at the top of each watershed to augment the existing permanent tags at the base of each transect. By having permenent marking tags at the start and end of each transect, potential errors in transect placement will be avoided.

Six of twelve plots re-sampled experienced significant increases in the amount of bare ground and rock cover ($p<0.05$) from 2001 to 2002. Ten of twelve plots showed statistically significant decreases in perennial grass cover ($p<0.05$) from year 2001 to 2002. No statistically significant increase or decrease occurred in tree and shrub cover ($p<0.05$), with the exception of watershed H, which experienced a 7.3% decrease in tree and shrub cover. The year 2002 saw below average precipitation throughout the region.

Site Description

The research site lies immediately north of Whitmire Canyon on the eastern edge of the Peloncillo Mountains in New Mexico, approximately 20 miles south of Animas, New Mexico. It is bordered on the east by the Animas Valley. Elevation is approximately 5400 feet. The site lies in the Madrean biogeographic province and the vegetation is classified as Madrean Evergreen Woodland (Brown & Lowe, 1978). Dominant overstory species include Emory oak (*Quercus emoryii*), Gray oak (*Quercus grisea*), Alligator juniper (*Juniperus deppiana*) and Mexican pinyon (*Pinus cembroides*). Shrubs include Skunkbush sumac (*Rhus trilobata*), Wright's silktassel (*Garrya wrightii*), Schott yucca (*Yucca schotti*), Palmer agave (*Agave palmeri*), manzanita (*Arctostapylos hookeri*) and beargrass (*Nolina microphylla*). Several small cacti are also found throughout the site. Perennial grasses are abundant. Of particular note is the dominant presence of purple grama (*Bouteloua radicosa*), which was found in every plot. Other grasses common to virtually every plot are little bluestem (*Schizachrium cirratum*), bull muhly (*Muhlenbergia emersleyi*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*) and wolftail (*Lycurus pheloides*).

A central ridge divides the drainages of Whitmire and Walnut Creeks. An access lies atop this ridge that allows for access to twelve plots. Six plots lie north of the ridge and drain into Walnut Creek, and the remaining six are south of the ridge and drain into Whitmire Creek. The terrain consists of moderate to steep canyons of about 100 to 400 feet in depth, with the plots lying within these canyons. A great deal of rock is exposed, and soil depths are shallow within the canyons.

Marking of plots

Twelve transects are located within each plot. The beginning and end of each transect is marked using a steel spike with a steel tagged number attached. Both the beginning and end of each transect have the same tag number, therefore one can easily determine where to place the transect measuring tape. The beginning of each transect lies approximately 1 to 2 meters above the stream bottom. Each transect was marked using permanent marking materials. A 10 inch steel spike was driven into the ground and an aluminum tag was attached to the spike. Approximately 3 or 4 inches of the spike is exposed above the ground surface with the remaining 6 to 7 inches driven securely into the ground. They

appear sturdy enough to survive a flood or fire event and to withstand trampling by livestock. The tags are numbered sequentially from 1 to 148. Tags 96, 97, 98 and 99 were not used to mark any transects. The tag numbers correspond to the photo-point and GPS numbers in the GPS/Photo-point log located in Appendix D. This will ensure more precise data collection by allowing more accurate transect placement in successive years. Repeat photography will be more easily facilitated, too. The integrity of the tags should be inspected annually during data collection. Below is the part number for the tags, available through Forestry Suppliers.

Round aluminum tags, page 15 of catalog 52.
Item: 79366 (#'s 1-100). $9.75
Available in numbers 1 through 1000.

GPS Coordinates

GPS coordinates were taken at each plot using a Garmin GPS II+. Readings are in UTM projection using map datum WGS 84. Estimated position error was calculated at 3 meters. Four readings were taken in each plot. See Figure 1 for description of where readings are taken in each plot. The UTM coordinates, and their corresponding tag numbers are located in Appendix D.

CD-ROM Data Disc

Data entered into Excel spreadsheets are available on the CD-ROM disc included in this report. Raw data are located in a folder titled "*Cascabel Data 2002.*" The raw data from 2000 and 2001 are also on this disc in their respective folders titled. The folder that will most likely be of greatest use lies within a folder titled "*Cascabel 2001 Report*," and is titled "2001 vs. 2002." This is a workbook in an Excel spreadsheet that contains the dissertation of the major categories of variables measured. It is a detailed analysis of the figures presented in Table 1, *Changes in % Cover 2001 vs. 2002.* The charts presented in this report are also contained in the same workbook.

Description of plots

There are 12 watersheds on the research site and each watershed contains 12 transects of 50 meters in length. All watersheds have either west-east or north-south aspects, therefore six transects were placed on either side of the watershed so that both aspects could be captured. Year 2000 data showed that slope aspect caused no significant difference in vegetation composition on either side of the watershed. The area sampled is approximately 1 hectare per watershed. The transects start about 2m up from the bottom of each side of the drainage and extend towards the top of the watershed (see Figure 1). One hundred points per transect are taken using the point intercept method (Bonham, 1989) to measure cover. Each watershed contains a total of 1200 points. Detailed descriptions describing methodology and monitoring concepts are found in the Cascabel 2000 report.

Data analysis

The transect is treated as the sample unit. Therefore each plot has a sample size (n) of 12. When a high degree of variability exists within a plot, it is appropriate to use the transect as the sample unit versus individual points (Elzinga , 1998).

Years 2000 and 2001 were compared using a paired samples t-test. This test is also known as a correlated or dependent samples t-test. This statistical test was chosen because, given the fact that the same transects are re-sampled, the two sample means are therefore related (or correlated) to each other. The formula for the paired samples t-test is given by

$$t = \frac{\overline{D} - \mu_D}{S_{\overline{D}}}$$

where $\overline{D}$ is the sample mean difference score, μ_D is the hypothesized population mean difference, and $S_{\overline{D}}$ is the standard error of the difference (Dretze & Heilman, 1998).

Testing was conducted for the following categories described below that are charted in Appendix A. Table 1, below, serves as a quick reference for understanding the changes in cover that took place between 2001 and 2002. Appendix B contains the p- values and confidence intervals for the table below as well as for the information found in the charts of Appendix A. Appendix C contains the raw data set used for the analyses.

Table 1

Changes in % Cover 2001 vs. 2002

Numbers in bold italics represent statistically significant differences at the $p < 0.05$ level. P-values for Table 1 are located on CD-ROM disc folder titled "2001 vs. 2002 t-test".

Plot	*Bare Ground 2001*	*Bare Ground 2002*	*Litter 2001*	*Litter 2002*	*Perennial Grass 2001 **	*Perennial Grass 2002*
A	20.4	24.1	***10.0***	***18.2***	***50.8***	***40.3***
B	30.9	37.8	***11.7***	***18.6***	***43.7***	***30.3***
C	***32.6***	***37.0***	***14.3***	***22.8***	***41.1***	***27.6***
EB	***28.8***	*36.5*	***8.8***	***19.1***	***47.8***	***28.8***
F	***20.4***	*32.5*	***13.8***	***29.3***	***47.9***	***22.2***
G	***22.4***	*37.7*	***11.3***	***24.1***	***51.4***	***27.5***
H	36.8	36.1	11.1	15.7	25.8	19.0
I	24.2	29.6	***7.3***	***18.7***	***47.1***	***35.2***
J2	***26.3***	***37.3***	***9.9***	***22.8***	***53.8***	***24.9***
K	35.4	41.4	***13.4***	***21.6***	***39.9***	***21.6***
M	***20.3***	***32.2***	16.3	21.7	***42.2***	***23.1***
N	21.9	23.9	***24.1***	***36.1***	23.3	22.7

* perennial grass is combined basal and litter cover.

Description of Chart Data

The charts contained in Appendix A contain details of changes that occurred from year 2000 to 2001. Below is a description of measurements that are contained in the charts.

Bare Ground

This measures all bare ground (soil) hits within the plot. It is reported as a percent cover of the entire plot. Unlike plant cover, this value should be as low as possible for the habitat type. If a value of 50% is measured one year but measures 60% the following year, this should give cause for alarm. The reason for this is that the higher percent cover of bare ground, the less the soil is protected from erosion.

Rock

This measures all hits upon solid bedrock or rocks larger than 1cm in diameter. Rocks are not prone to erosion on the human time scale and therefore an increase in rock cover is not a great cause of concern. However, a loss of vegetative cover exposes more rock, and an increase in rock cover could be due to loss of plant cover.

Bare Ground + Rock

Functional categories of variables measured were used to perform the analysis. Bare ground (soil) and rock were combined to form one category called bare ground + rock. Deciding the difference between bare ground and rock when sampling can be difficult since boundary decisions are always being made at virtually every data point. By combining bare ground and rock, the variability among field personnel can be minimized to allow for a more precise data analysis.

Litter

Litter is defined as a mulch or duff layer that lies on top of the soil. It can be a thick organic layer, animal dung, or loose leaves. As long as it covers and adequately protects the soil from wind and rain, it qualifies as litter. When sampling in the field, judgment calls must be made as to whether the point is soil or litter. Most soil contains organic matter at the surface. However, it is the size of these particles and the differentiation of them as soil or litter that cause the most confusion amongst field personnel. I use what is known as the "raindrop test" to make these decisions. If you visualize a raindrop falling and striking the soil with all its kinetic energy, then it will surely impact the soil with enough force to explode and erode soil particles. If the litter object under scrutiny is able to absorb and disperse that energy and prevent soil damage, then it probably qualifies as litter.

Perennial grass basal

Basal cover measurements are commonly used in monitoring protocols. Basal cover measures only the center crown of an individual grass plant that is rooted in the ground. The leaves that project out beyond this central clump of grass are not counted. Very little basal cover exists in arid grasslands, and making accurate measurements of basal cover are difficult. Furthermore, sample sizes large enough to accurately measure changes in basal cover are beyond the scope of a project such as this. However, basal cover is recorded because it is standard protocol in most monitoring projects.

Perennial grass leaf

This is a measure of the leaf (or aerial) cover of grasses that project out over the main basal clump of grass. An average of 3 times more leaf cover than basal cover exists at

the research site; therefore, we can detect changes in leaf cover more precisely than we can basal cover. Leaf cover is important because grass leaves help to protect the soil from raindrop impact.

Perennial grass total
This is the sum total of basal and leaf cover measurements. It provides a more accurate view of how much cover actually is present on the plot. A high cover value or an increasing trend in percent cover is desired. This measurement is the combined total of basal and aerial cover for all perennial grasses within the plot.

Tree and Shrub
This includes oak, manzanita, agave or any other thick stemmed tree or shrub. The sampling design used is tailored for measuring grass cover more than it is for measuring trees and shrubs. The distribution of trees and shrubs is not as even as it is for grasses. Therefore measurements within the plot can vary widely and standard deviations tend to be high. Significance testing, such as a t-test, is probably not a wise tool for evaluating changes in tree and shrub cover. The confidence intervals located in the 2000 vs. 2001 workbook and in Appendix B describe the inherent variability of tree and shrub cover. Aerial photography would be a better tool for measuring tree and shrub cover more accurately.

Literature Cited

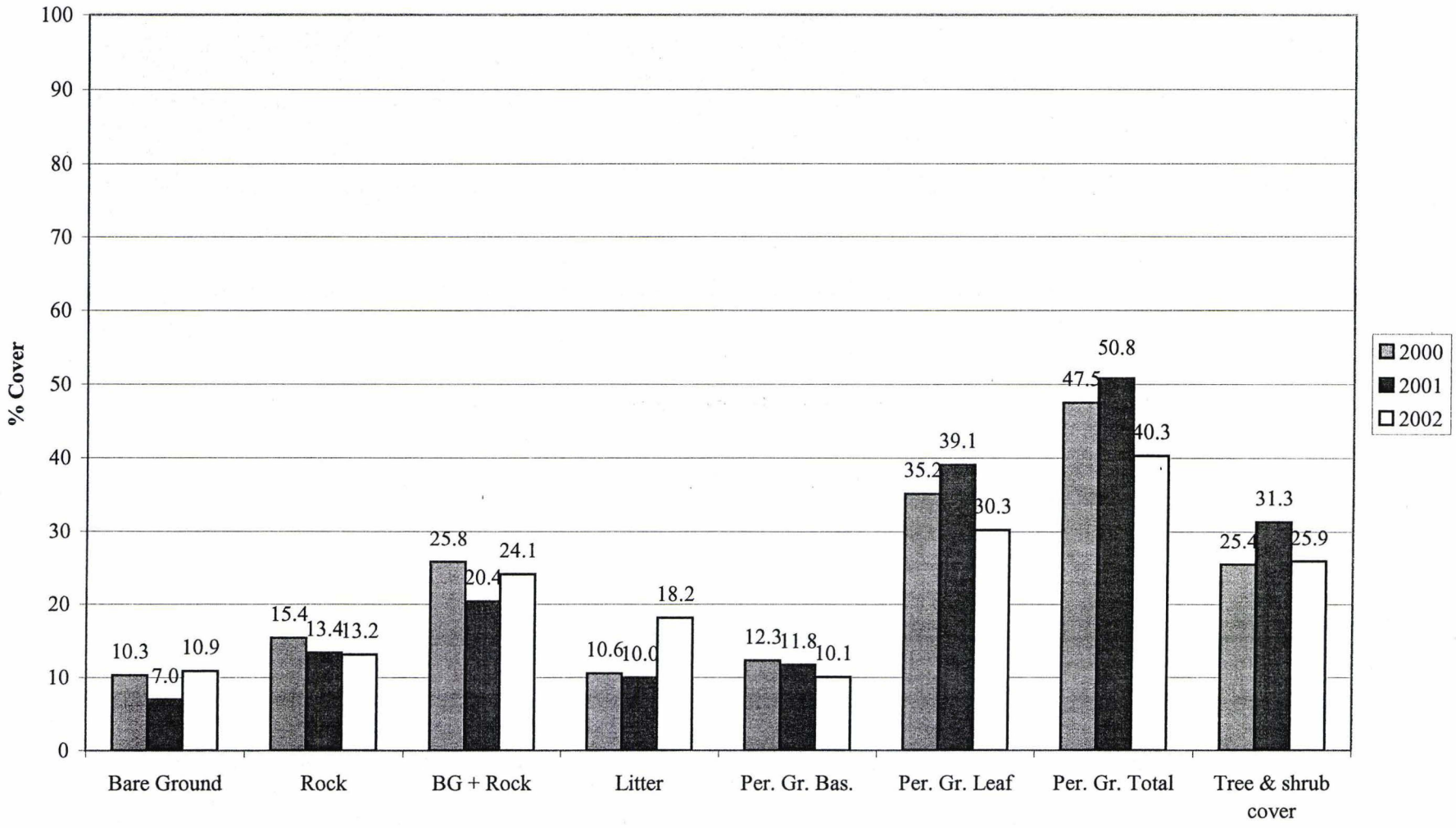
Bonham, Charles D. 1989. Measurements for Terrestrial Vegetation. John Wiley and Sons, Inc. New York.

Brown, D.E., C.H. Lowe. 1980. Biotic Communities of the Southwest. USDA Forest Service Technical Report RM-78. Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

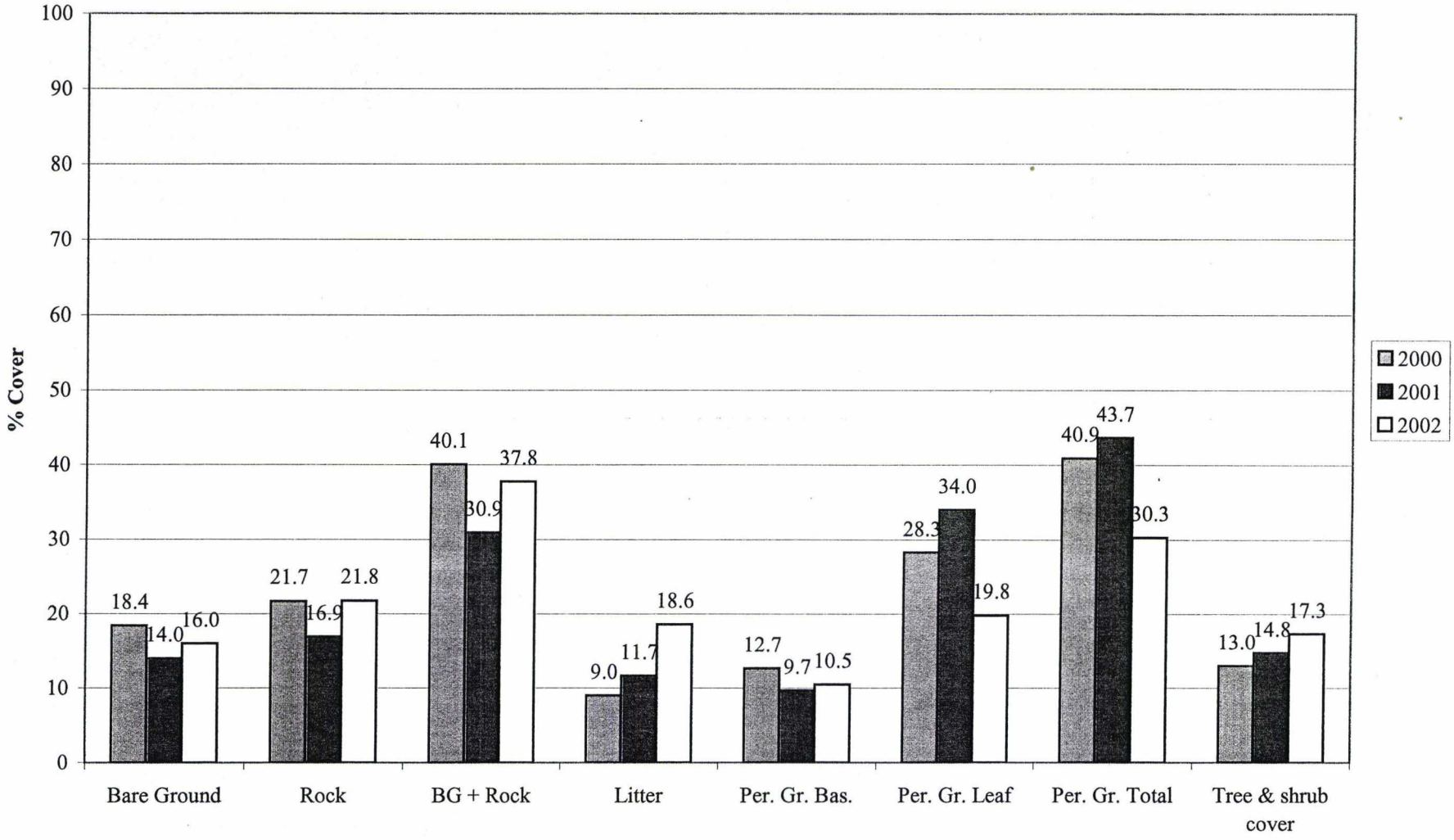
Dretzke, B.J., Heilman, K.A. 1998. Statistics with Microsoft Excel. Prentice Hall Inc. Upper Saddle River, NJ.

Elzinga, C.L., D.W. Salzer and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. BLM Technical Reference 1730-1.

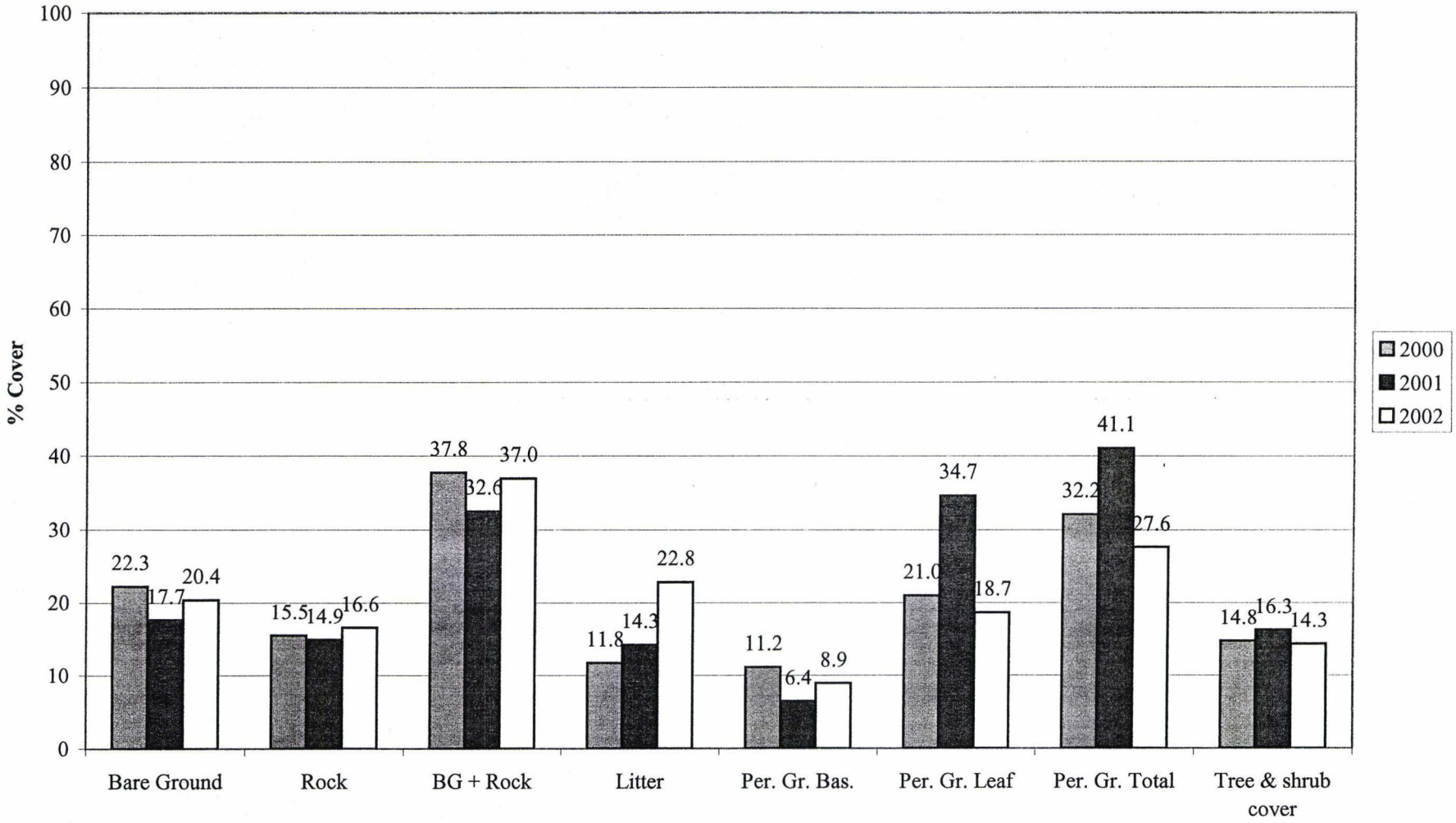
Watershed A
2000-2002



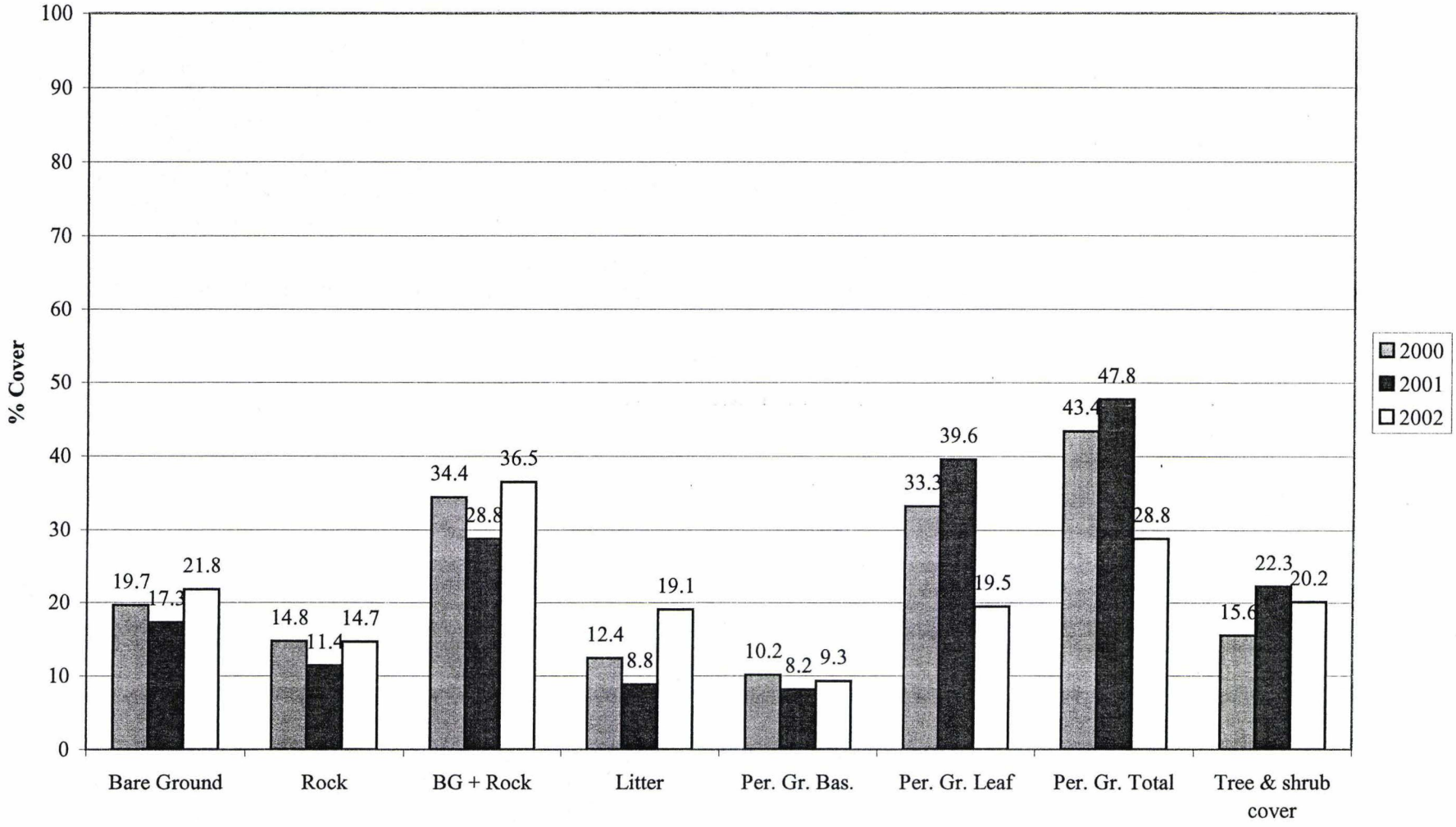
Watershed B
2000-2002



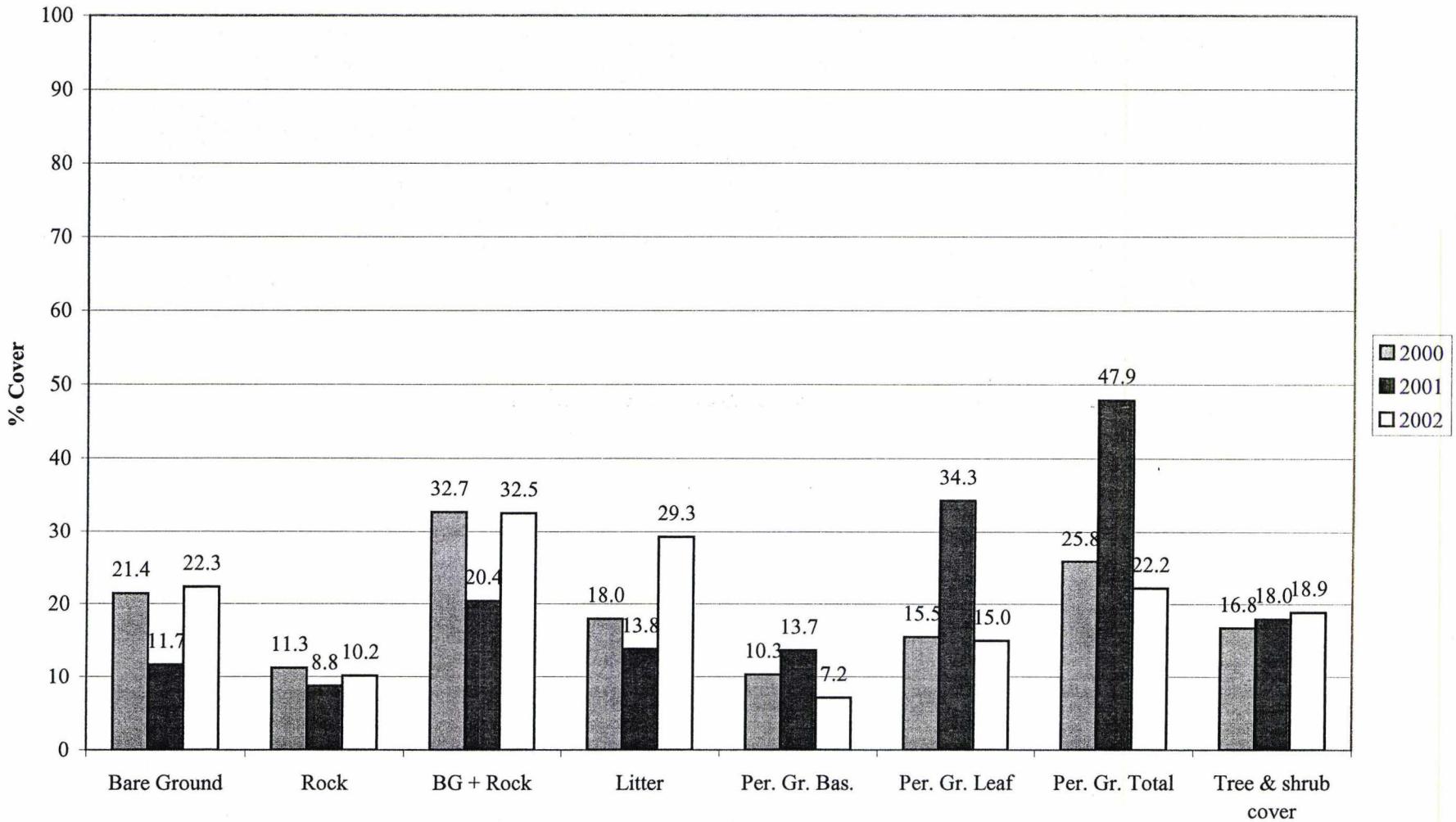
Watershed C
2000-2002



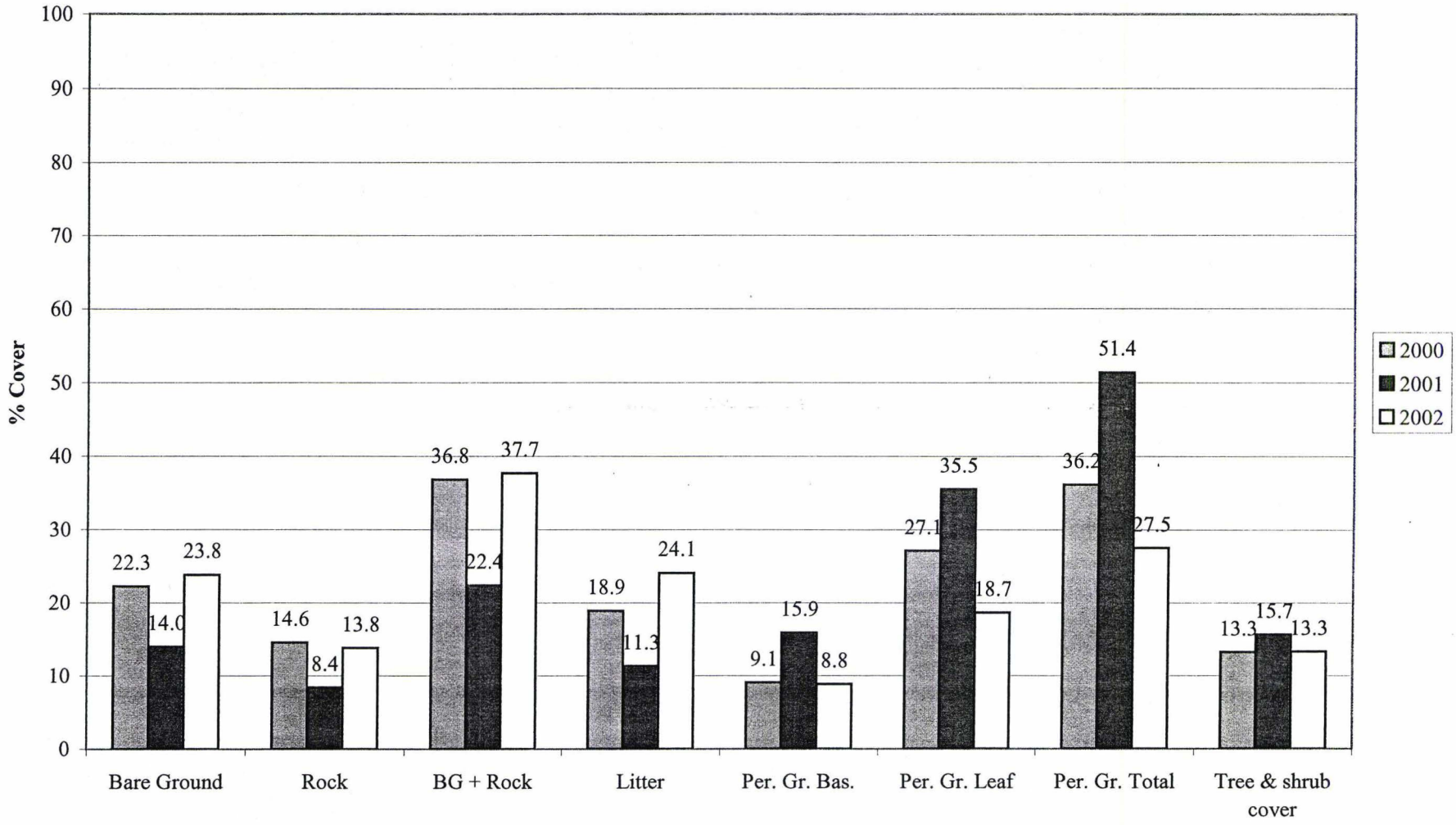
Watershed EB
2000-2002



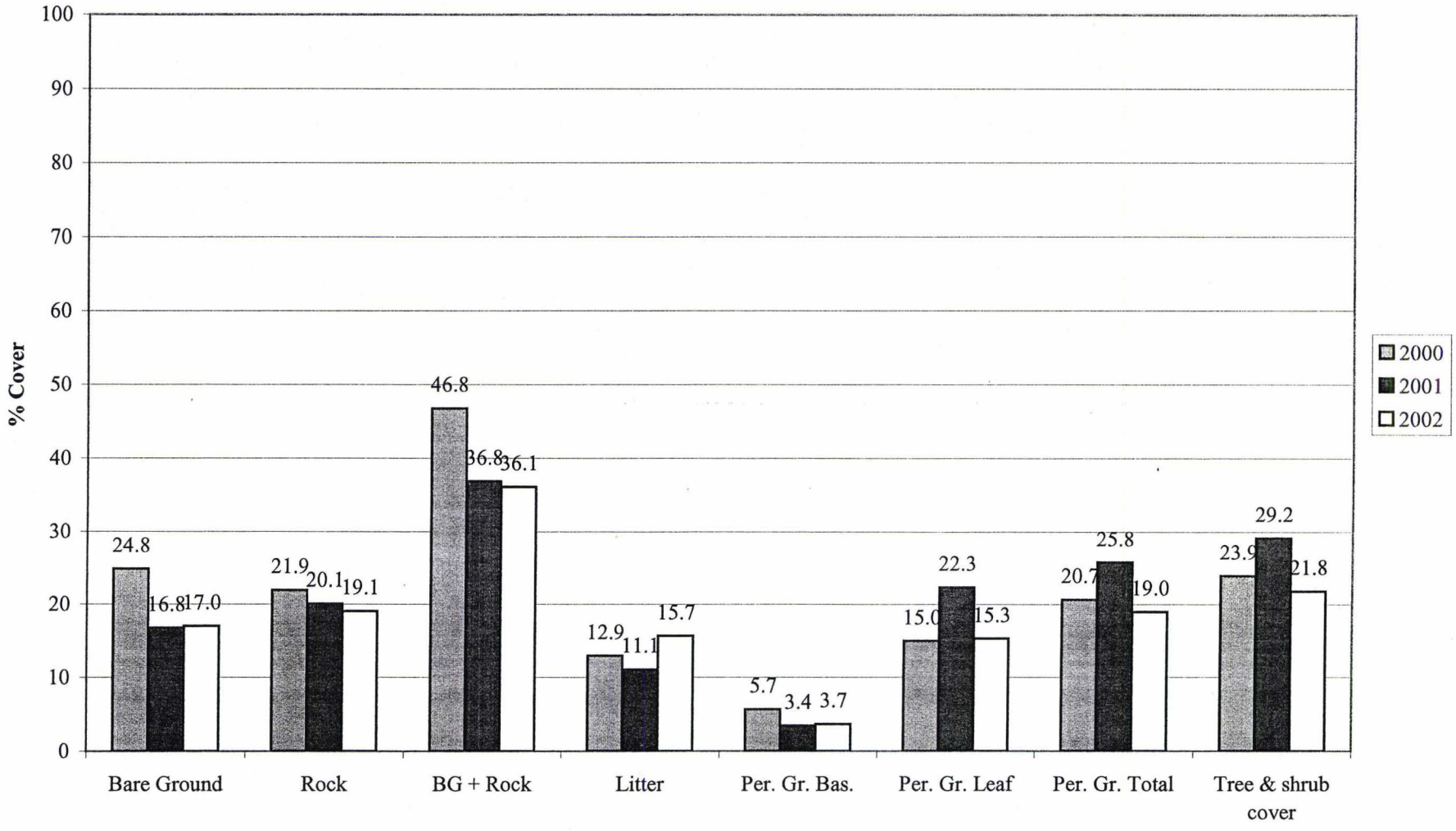
Watershed F
2000-2002



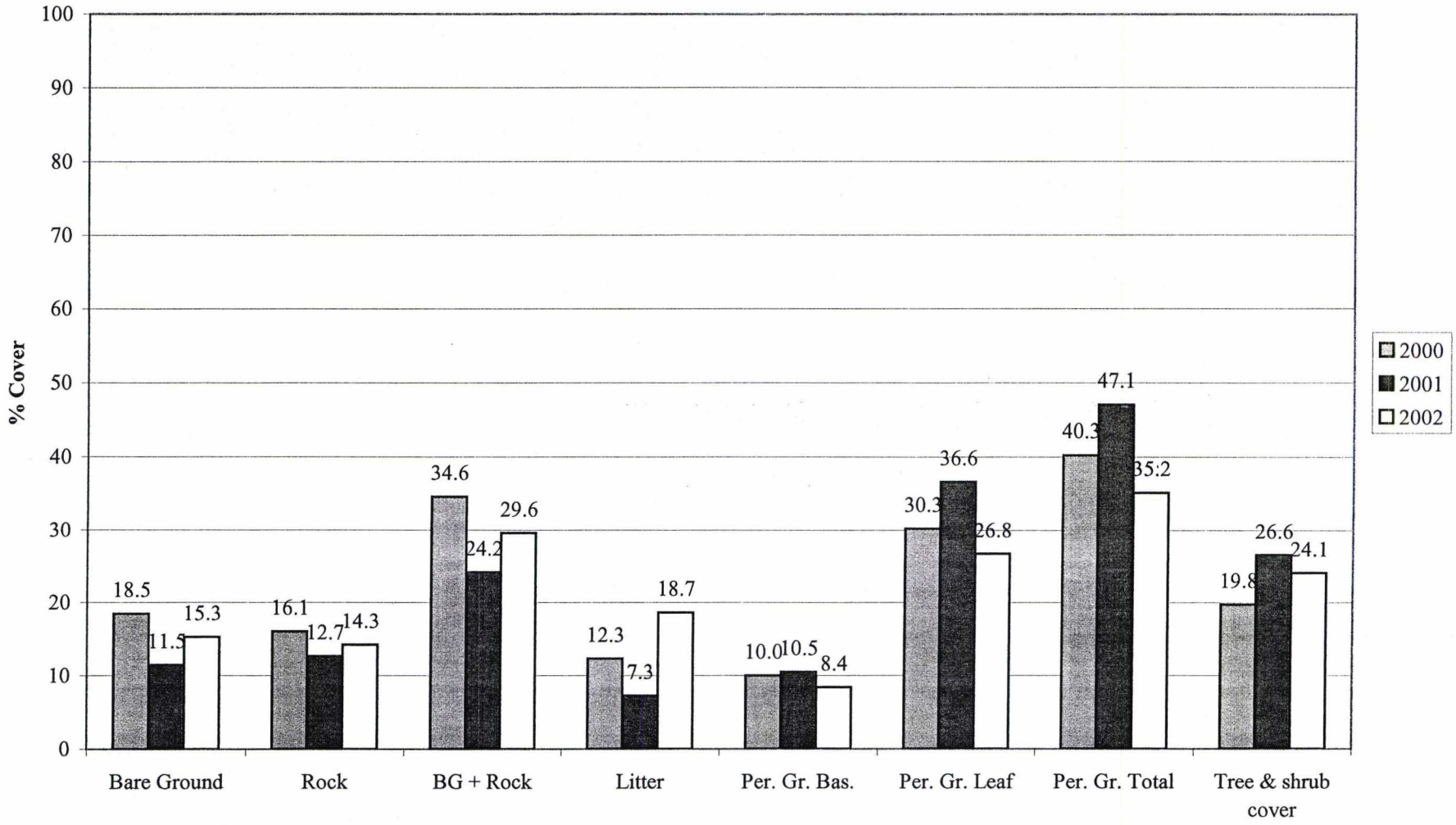
Watershed G
2000-2002



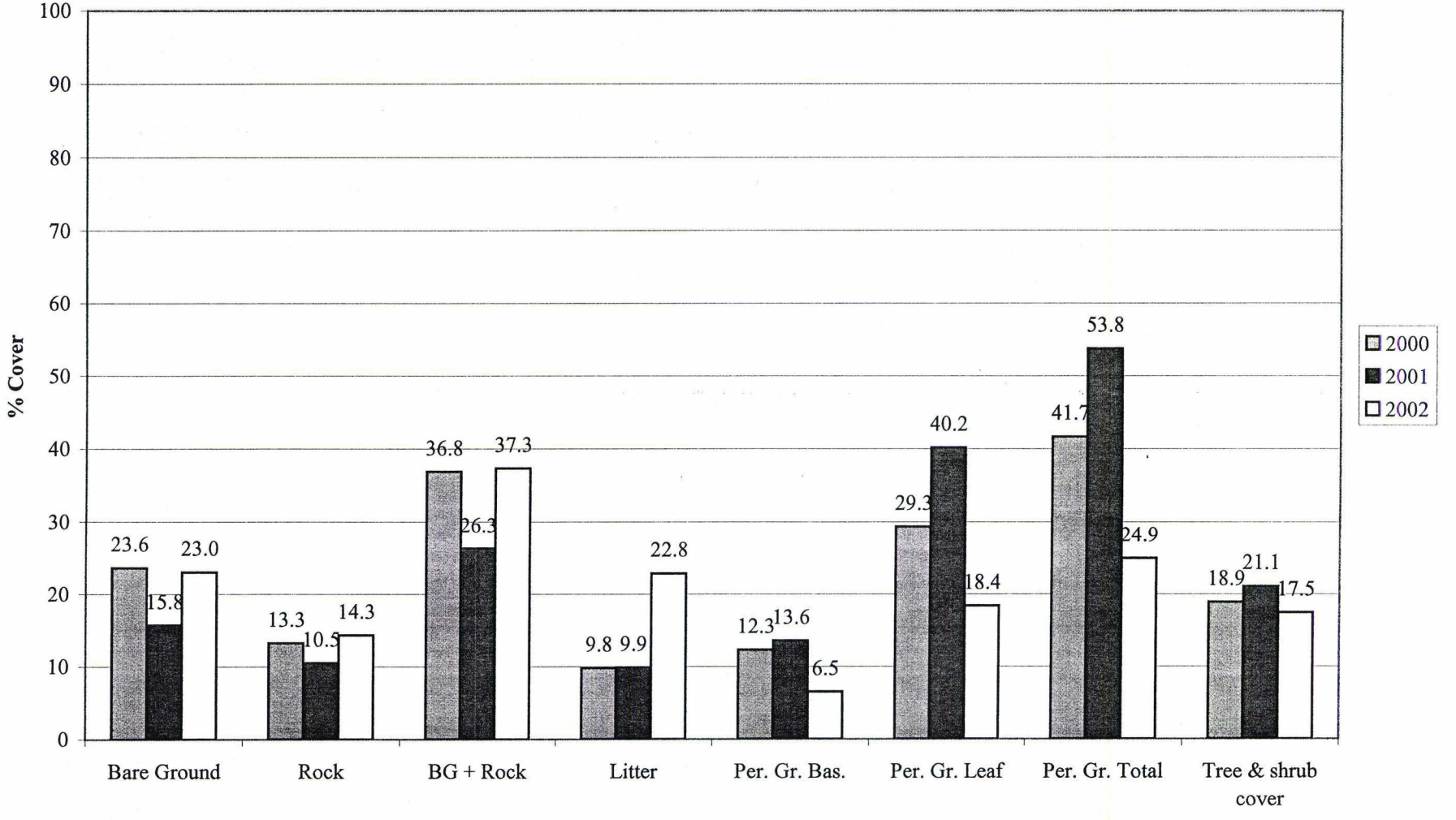
Watershed H
2000-2002



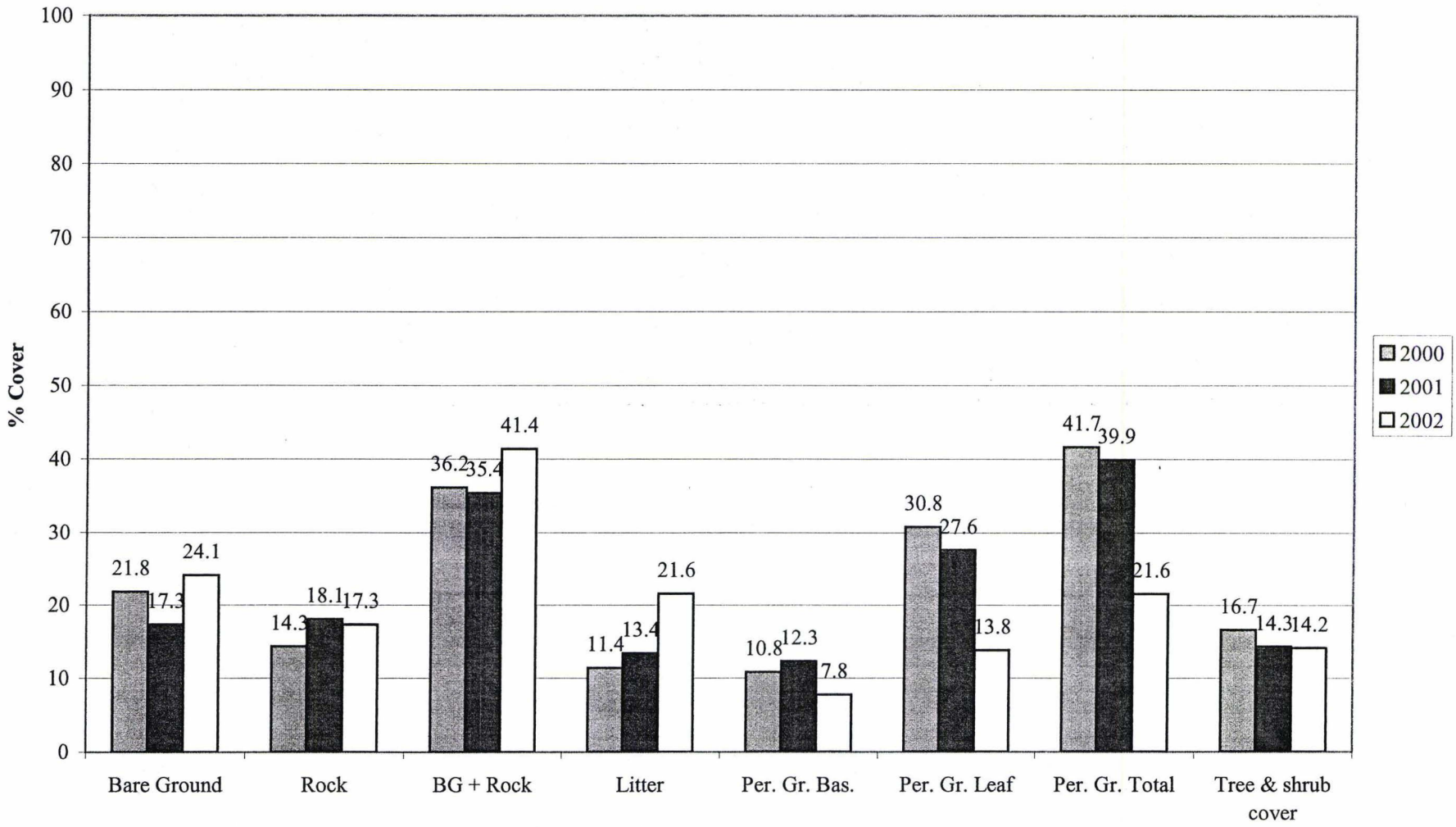
Watershed I
2000-2002



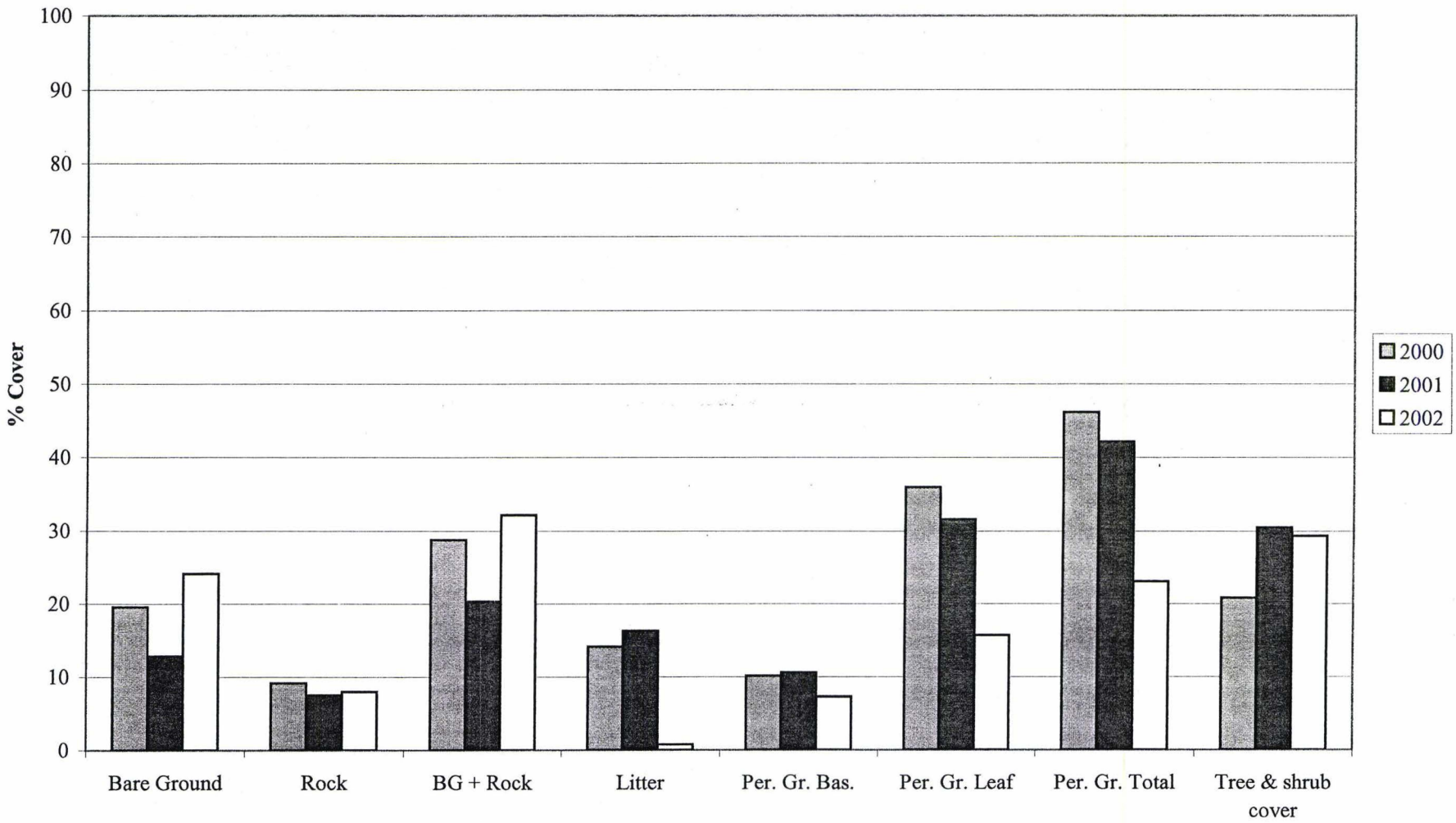
Watershed J2
2000-2002

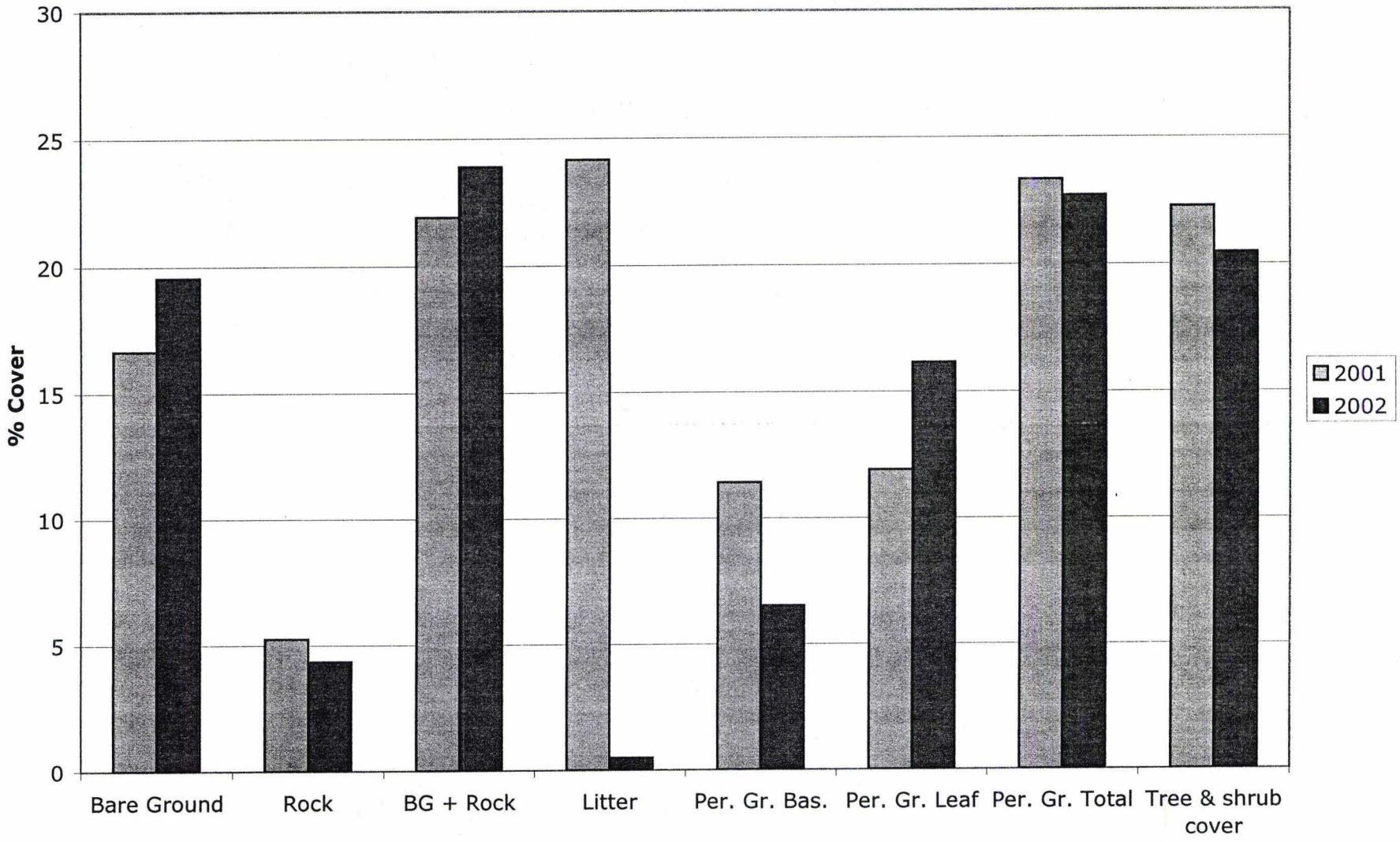


Watershed K
2000-2002



Watershed M
2000-2002




Watershed N 2001-2002
30
25
20
15
10
5
0
% Cover
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover
2001
2002

2002 p value	Watershed A	2000	2001	2002
	Bare Ground	10.3	7.0	10.9
	Rock	15.4	13.4	13.2
	BG + Rock	25.8	20.4	24.1
	Litter	10.6	10.0	18.2
	Per. Gr. Bas.	12.3	11.8	10.1
	Per. Gr. Leaf	35.2	39.1	30.3
	Per. Gr. Total	47.5	50.8	40.3
	Tree & shrub	25.4	31.3	25.9

	B 2000	2000	2001	2002
	Bare Ground	18.4	14.0	16.0
	Rock	21.7	16.9	21.8
	BG + Rock	40.1	30.9	37.8
	Litter	9.0	11.7	18.6
	Per. Gr. Bas.	12.7	9.7	10.5
	Per. Gr. Leaf	28.3	34.0	19.8
	Per. Gr. Total	40.9	43.7	30.3
	Tree & shrub	13.0	14.8	17.3

	B 2001
	Bare Ground
	Rock
	BG + Rock
	Litter
	Per. Gr. Bas.
	Per. Gr. Leaf
	Per. Gr. Total
	Tree & shrub cover

	C	2000	2001	2002
	Bare Ground	22.3	17.7	20.4
	Rock	15.5	14.9	16.6
	BG + Rock	37.8	32.6	37.0
	Litter	11.8	14.3	22.8
	Per. Gr. Bas.	11.2	6.4	8.9

Per. Gr. Leaf	29	19	32	11	18	14	20.500	8.313
Per. Gr. Total	37	30	48	18	23	20	29.333	11.518
Tree & shrub cover	11	8	9	17	22	12	13.167	5.345

Per. Gr. Leaf	29	30	25	29	32	36	30.167	3.656
Per. Gr. Total	36	35	34	35	43	40	37.167	3.545
Tree & shrub cover	21	12	22	15	17	16	17.167	3.764

Per. Gr. Leaf	29	19	32	11	18	14	21	7	0.000
Per. Gr. Total	37	30	48	18	23	20	27	15	0.004
Tree & shrub	11	8	9	17	22	12	3	7	0.337

C west 2002. This plot was labeled D west in 20							Mean	SD
Bare Ground	23	18	19	11	17	12	16.667	4.502
Rock	23	15	15	20	15	23	18.500	3.987
BG + Rock	46	33	34	31	32	35	35.167	5.492
Litter	24	44	24	20	23	20	25.833	9.087
Per. Gr. Bas.	6	8	3	18	10	9	9.000	5.060
Per. Gr. Leaf	21	7	14	18	21	20	16.833	5.492
Per. Gr. Total	27	15	17	36	31	29	25.833	8.208
Tree & shrub cover	3	7	29	16	18	20	15.500	9.354

C west 2001							Mean	SD	p value
Bare Ground	16	16	7	19	10	20	14.667	5.125	0.584
Rock	23	9	10	10	16	13	13.500	5.320	0.049
BG + Rock	39	25	17	29	26	33	28.167	7.494	0.027
Litter	5	18	10	17	17	12	13.167	5.115	0.016
Per. Gr. Bas.	10	5	5	3	6	6	5.833	2.317	0.294
Per. Gr. Leaf	36	40	43	37	38	41	39.167	2.639	0.001
Per. Gr. Total	46	45	48	40	44	47	45.000	2.828	0.006
Tree & shrub cover	14	7	31	13	12	15	15.333	8.165	0.950

C 2001													Mean	SD	95% CI	sigma
Bare Ground	19	28	17	21	17	22	16	16	7	19	10	20	17.67	5.43	3.07	6.216
Rock	17	15	24	12	11	19	23	9	10	10	16	13	14.92	5.05	2.86	4.818
BG + Rock	36	43	41	33	28	41	39	25	17	29	26	33	32.58	7.87	4.45	7.558
Litter	11	15	14	26	17	9	5	18	10	17	17	12	14.25	5.41	3.06	6.739
Per. Gr. Bas.	7	5	9	6	11	4	10	5	5	3	6	6	6.42	2.43	1.37	3.404
Per. Gr. Leaf	29	30	25	29	32	36	36	40	43	37	38	41	34.67	5.60	3.17	6.291
Per. Gr. Total	36	35	34	35	43	40	46	45	48	40	44	47	41.08	5.11	2.89	7.408
Tree & shrub	21	12	22	15	17	16	14	7	31	13	12	15	16.25	6.14	3.47	6.751

EB North 2002								
Bare Ground	24	30	25	19	23	25	24.333	3.559
Rock	11	24	8	16	8	19	14.333	6.470
BG + Rock	35	54	33	35	31	44	38.667	8.733
Litter	23	15	16	20	12	19	17.500	3.937
Per. Gr. Bas.	9	12	8	11	12	11	10.500	1.643
Per. Gr. Leaf	28	15	32	7	25	20	21.167	9.152
Per. Gr. Total	37	27	40	18	37	31	31.667	8.189
Tree & shrub cover	7	6	16	34	34	7	17.333	13.411

EB north 2001							Mean	SD	p value
Bare Ground	16	22	12	11	19	25	17.500	5.541	0.013
Rock	6	12	11	6	5	9	8.167	2.927	0.044
BG + Rock	22	34	23	17	24	34	25.667	6.890	0.001
Litter	16	5	12	7	7	10	9.500	4.037	0.002
Per. Gr. Bas.	15	13	8	6	3	5	8.333	4.719	0.378
Per. Gr. Leaf	41	33	42	53	49	38	42.667	7.285	0.010
Per. Gr. Total	56	46	50	59	52	43	51.000	6.000	0.008
Tree & shrub cover	18	8	21	34	32	7	20.000	11.472	0.225

EB 2002													Mean	SD	95% CI
Bare Ground	24	30	25	19	23	25	31	25	21	16	13	10	21.83	6.38	3.61	0.065
Rock	11	24	8	16	8	19	14	13	23	17	15	8	14.67	5.50	3.11	0.138
BG + Rock	35	54	33	35	31	44	45	38	44	33	28	18	36.50	9.38	5.30	0.025
Litter	23	15	16	20	12	19	27	22	10	15	29	21	19.08	5.76	3.26	0.000
Per. Gr. Bas.	9	12	8	11	12	11	8	8	7	7	8	11	9.33	1.92	1.09	0.451
Per. Gr. Leaf	28	15	32	7	25	20	16	24	12	16	14	25	19.50	7.37	4.17	0.000
Per. Gr. Total	37	27	40	18	37	31	24	32	19	23	22	36	28.83	7.66	4.33	0.000
Tree & shrub	7	6	16	34	34	7	2	9	34	42	23	28	20.17	13.95	7.89	0.624

EB South 2002							Mean	SD
Bare Ground	31	25	21	16	13	10	19.333	7.866
Rock	14	13	23	17	15	8	15.000	4.940
BG + Rock	45	38	44	33	28	18	34.333	10.289
Litter	27	22	10	15	29	21	20.667	7.174
Per. Gr. Bas.	8	8	7	7	8	11	8.167	1.472
Per. Gr. Leaf	16	24	12	16	14	25	17.833	5.382
Per. Gr. Total	24	32	19	23	22	36	26.000	6.542
Tree & shrub cover	2	9	34	42	23	28	23.000	15.126

EB south 2001							Mean	SD	p value
Bare Ground	18	15	19	15	11	25	17.167	4.750	0.609
Rock	23	14	20	16	2	13	14.667	7.257	0.918
BG + Rock	41	29	39	31	13	38	31.833	10.362	0.630
Litter	8	14	7	4	8	8	8.167	3.251	0.006
Per. Gr. Bas.	12	2	4	13	11	6	8.000	4.604	0.939
Per. Gr. Leaf	34	37	25	41	46	36	36.500	7.064	0.003
Per. Gr. Total	46	39	29	54	57	42	44.500	10.252	0.016
Tree & shrub cover	10	22	32	14	54	15	24.500	16.392	0.866

EB 2001													Mean	SD	95% CI	sigma
Bare Ground	16	22	12	11	19	25	18	15	19	15	11	25	17.33	4.92	2.79	5.652
Rock	6	12	11	6	5	9	23	14	20	16	2	13	11.42	6.27	3.55	5.886
BG + Rock	22	34	23	17	24	34	41	29	39	31	13	38	28.75	8.99	5.08	9.181
Litter	16	5	12	7	7	10	8	14	7	4	8	8	8.83	3.56	2.02	4.661
Per. Gr. Bas.	15	13	8	6	3	5	12	2	4	13	11	6	8.17	4.45	2.52	3.186
Per. Gr. Leaf	41	33	42	53	49	38	34	37	25	41	46	36	39.58	7.56	4.28	7.464
Per. Gr. Total	56	46	50	59	52	43	46	39	29	54	57	42	47.75	8.70	4.92	8.180
Tree & shrub	18	8	21	34	32	7	10	22	32	14	54	15	22.25	13.69	7.75	13.820

F east 2002							Mean	SD
Bare Ground	25	13	11	26	27	31	22.167	8.159
Rock	10	9	8	12	9	15	10.500	2.588
BG + Rock	35	22	19	38	36	46	32.667	10.231
Litter	25	43	35	34	22	31	31.667	7.528
Per. Gr. Bas.	6	8	7	9	6	6	7.000	1.265
Per. Gr. Leaf	19	16	23	14	16	9	16.167	4.708
Per. Gr. Total	25	24	30	23	22	15	23.167	4.875
Tree & shrub cover	19	13	25	9	26	5	16.167	8.589

F east 2001							Mean	SD	p value
Bare Ground	8	8	8	11	10	11	9.333	1.506	0.007
Rock	6	5	3	13	10	13	8.333	4.274	0.101
BG + Rock	14	13	11	24	20	24	17.667	5.750	0.002
Litter	24	10	12	2	15	11	12.333	7.174	0.015
Per. Gr. Bas.	9	13	12	26	16	12	14.667	5.989	0.015
Per. Gr. Leaf	43	35	57	27	36	29	37.833	10.962	0.001
Per. Gr. Total	52	48	69	53	52	41	52.500	9.225	0.000
Tree & shrub cover	18	40	30	14	17	20	23.167	9.888	0.231

F 2002													Mean	SD	95% CI
Bare Ground	25	13	11	26	27	31	33	15	15	16	27	29	22.33	7.75	4.38	0.001
Rock	10	9	8	12	9	15	8	6	1	20	7	17	10.17	5.17	2.92	0.212
BG + Rock	35	22	19	38	36	46	41	21	16	36	34	46	32.50	10.43	5.90	0.000
Litter	25	43	35	34	22	31	35	34	10	29	21	32	29.25	8.64	4.89	0.001
Per. Gr. Bas.	6	8	7	9	6	6	13	9	3	5	6	8	7.17	2.52	1.42	0.001
Per. Gr. Leaf	19	16	23	14	16	9	6	7	29	11	25	5	15.00	7.84	4.44	0.000
Per. Gr. Total	25	24	30	23	22	15	19	16	32	16	31	13	22.17	6.53	3.70	0.000
Tree & shrub	19	13	25	9	26	5	7	32	55	20	10	6	18.92	14.39	8.14	0.868

F West 2002							Mean	SD
Bare Ground	33	15	15	16	27	29	22.500	8.093
Rock	8	6	1	20	7	17	9.833	7.195

F west 2001							Mean	SD	p value
Bare Ground	11	11	7	20	9	26	14.000	7.376	0.087
Rock	8	4	7	12	9	15	9.167	3.869	0.741

F 2001													Mean	SD	95% CI	sigma
Bare Ground	8	8	8	11	10	11	11	11	7	20	9	26	11.67	5.63	3.19	6.690
Rock	6	5	3	13	10	13	8	4	7	12	9	15	8.75	3.91	2.21	4.539

Per. Gr. Leaf	21.0	34.7	18.7
Per. Gr. Total	32.2	41.1	27.6
Tree & shrub	14.8	16.3	14.3

C 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

EB	2000	2001	2002
Bare Ground	19.7	17.3	21.8
Rock	14.8	11.4	14.7
BG + Rock	34.4	28.8	36.5
Litter	12.4	8.8	19.1
Per. Gr. Bas.	10.2	8.2	9.3
Per. Gr. Leaf	33.3	39.6	19.5
Per. Gr. Total	43.4	47.8	28.8
Tree & shrub	15.6	22.3	20.2

EB 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

F	2000	2001	2002
Bare Ground	21.4	11.7	22.3
Rock	11.3	8.8	10.2
BG + Rock	32.7	20.4	32.5
Litter	18.0	13.8	29.3
Per. Gr. Bas.	10.3	13.7	7.2
Per. Gr. Leaf	15.5	34.3	15.0
Per. Gr. Total	25.8	47.9	22.2
Tree & shrub	16.8	18.0	18.9

F 2001
Bare Ground
Rock

BG + Rock	41	21	16	36	34	46	32.333	11.605
Litter	35	34	10	29	21	32	26.833	9.663
Per. Gr. Bas.	13	9	3	5	6	8	7.333	3.502
Per. Gr. Leaf	6	7	29	11	25	5	13.833	10.477
Per. Gr. Total	19	16	32	16	31	13	21.167	8.232
Tree & shrub cover	7	32	55	20	10	6	21.667	19.065

G East 2002							Mean	SD
Bare Ground	26	23	25	25	16	24	23.167	3.656
Rock	7	5	8	2	16	29	11.167	9.908
BG + Rock	33	28	33	27	32	53	34.333	9.501
Litter	33	22	32	23	24	24	26.333	4.844
Per. Gr. Bas.	10	9	9	9	10	7	9.000	1.095
Per. Gr. Leaf	12	32	14	29	14	9	18.333	9.647
Per. Gr. Total	22	41	23	38	24	16	27.333	9.873
Tree & shrub cover	16	9	14	19	22	7	14.500	5.753

G West 2002							Mean	SD
Bare Ground	23	25	26	34	14	25	24.500	6.411
Rock	8	11	21	19	17	23	16.500	5.857
BG + Rock	31	36	47	53	31	48	41.000	9.529
Litter	34	15	21	19	15	27	21.833	7.441
Per. Gr. Bas.	5	7	17	10	10	3	8.667	4.926
Per. Gr. Leaf	21	19	10	18	23	23	19.000	4.858
Per. Gr. Total	26	26	27	28	33	26	27.667	2.733
Tree & shrub cover	15	30	4	0	24	0	12.167	12.875

H North 2002							Mean	SD
Bare Ground	12	31	23	17	16	16	19.167	6.795
Rock	28	17	15	13	23	20	19.333	5.538
BG + Rock	40	48	38	30	39	36	38.500	5.857
Litter	28	13	11	15	16	25	18.000	6.870
Per. Gr. Bas.	3	5	2	2	2	6	3.333	1.751
Per. Gr. Leaf	6	22	11	21	2	12	12.333	7.967
Per. Gr. Total	9	27	13	23	4	18	15.667	8.664
Tree & shrub cover	18	7	22	30	11	23	18.500	8.408

H South 2002							Mean	SD
Bare Ground	17	20	16	9	13	14	14.833	3.764
Rock	23	27	12	17	17	17	18.833	5.307
BG + Rock	40	47	28	26	30	31	33.667	8.116
Litter	15	6	19	16	12	12	13.333	4.457
Per. Gr. Bas.	0	3	3	5	3	10	4.000	3.347
Per. Gr. Leaf	12	12	10	21	26	29	18.333	8.116
Per. Gr. Total	12	15	13	26	29	39	22.333	10.801
Tree & shrub cover	18	20	27	22	34	30	25.167	6.210

BG + Rock	19	15	14	32	18	41	23.167	10.870	0.037
Litter	15	23	18	14	15	7	15.333	5.241	0.060
Per. Gr. Bas.	13	13	16	16	8	10	12.667	3.204	0.059
Per. Gr. Leaf	29	31	29	26	39	30	30.667	4.412	0.007
Per. Gr. Total	42	44	45	42	47	40	43.333	2.503	0.000
Tree & shrub cover	18	13	10	10	21	5	12.833	5.845	0.356

G east 2001							Mean	SD	p value
Bare Ground	17	18	22	14	13	11	15.833	3.971	0.008
Rock	9	5	15	15	7	5	9.333	4.633	0.746
BG + Rock	26	23	37	29	20	16	25.167	7.360	0.191
Litter	13	10	11	9	10	7	10.000	2.000	0.000
Per. Gr. Bas.	17	18	18	17	24	19	18.833	2.639	0.000
Per. Gr. Leaf	31	40	24	36	30	32	32.167	5.456	0.003
Per. Gr. Total	48	58	42	53	54	51	51.000	5.514	0.001
Tree & shrub cover	14	32	6	0	11	9	12.000	10.900	0.690

G west 2001							Mean	SD	p value
Bare Ground	8	17	12	11	6	19	12.167	5.037	0.005
Rock	5	3	5	9	13	10	7.500	3.782	0.007
BG + Rock	13	20	17	20	19	29	19.667	5.279	0.001
Litter	21	11	11	14	10	9	12.667	4.412	0.010
Per. Gr. Bas.	17	16	11	3	18	13	13.000	5.550	0.267
Per. Gr. Leaf	48	31	48	32	37	37	38.833	7.521	0.006
Per. Gr. Total	65	47	59	35	55	50	51.833	10.439	0.003
Tree & shrub cover	17	17	17	30	14	21	19.333	5.680	0.354

H west 2001 (possibly North)							Mean	SD	p value
Bare Ground	19	16	16	15	14	7	14.500	4.037	0.188
Rock	17	21	18	18	17	10	16.833	3.656	0.442
BG + Rock	36	37	34	33	31	17	31.333	7.339	0.065
Litter	7	10	5	11	15	5	8.833	3.920	0.054
Per. Gr. Bas.	3	7	0	2	5	8	4.167	3.061	0.317
Per. Gr. Leaf	42	35	36	25	23	30	31.833	7.195	0.007
Per. Gr. Total	45	42	36	27	28	38	36.000	7.294	0.005
Tree & shrub cover	23	13	30	35	20	48	28.167	12.384	0.027

H east 2001 (maybe south)							Mean	SD	p value
Bare Ground	29	14	21	16	17	17	19.000	5.404	0.145
Rock	28	28	25	18	25	16	23.333	5.125	0.091
BG + Rock	57	42	46	34	42	33	42.333	8.779	0.064
Litter	14	19	8	12	12	15	13.333	3.670	1.000
Per. Gr. Bas.	3	5	1	4	1	2	2.667	1.633	0.438
Per. Gr. Leaf	8	13	8	23	13	12	12.833	5.492	0.143
Per. Gr. Total	11	18	9	27	14	14	15.500	6.411	0.186
Tree & shrub cover	14	21	43	35	38	30	30.167	10.907	0.179

BG + Rock	14	13	11	24	20	24	19	15	14	32	18	41	20.42	8.77	4.96	9.603
Litter	24	10	12	2	15	11	15	23	18	14	15	7	13.83	6.19	3.50	7.413
Per. Gr. Bas.	9	13	12	26	16	12	13	13	16	16	8	10	13.67	4.70	2.66	3.607
Per. Gr. Leaf	43	35	57	27	36	29	29	31	29	26	39	30	34.25	8.80	4.98	8.321
Per. Gr. Total	52	48	69	53	52	41	42	44	45	42	47	40	47.92	8.03	4.54	7.281
Tree & shrub	18	40	30	14	17	20	18	13	10	10	21	5	18.00	9.44	5.34	11.913

G 2002													Mean	SD	95% CI	
Bare Ground	26	23	25	25	16	24	23	25	26	34	14	25	23.83	5.02	2.84	0.000
Rock	7	5	8	2	16	29	8	11	21	19	17	23	13.83	8.24	4.66	0.093
BG + Rock	33	28	33	27	32	53	31	36	47	53	31	48	37.67	9.72	5.50	0.002
Litter	33	22	32	23	24	24	34	15	21	19	15	27	24.08	6.43	3.64	0.000
Per. Gr. Bas.	10	9	9	9	10	7	5	7	17	10	10	3	8.83	3.41	1.93	0.004
Per. Gr. Leaf	12	32	14	29	14	9	21	19	10	18	23	23	18.67	7.29	4.12	0.000
Per. Gr. Total	22	41	23	38	24	16	26	26	27	28	33	26	27.50	6.91	3.91	0.000
Tree & shrub	16	9	14	19	22	7	15	30	4	0	24	0	13.33	9.59	5.42	0.622

G 2001													Mean	SD	95% CI	sigma
Bare Ground	17	18	22	14	13	11	8	17	12	11	6	19	14.00	4.73	2.68	4.877
Rock	9	5	15	15	7	5	5	3	5	9	13	10	8.42	4.14	2.34	6.194
BG + Rock	26	23	37	29	20	16	13	20	17	20	19	29	22.42	6.75	3.82	8.233
Litter	13	10	11	9	10	7	21	11	11	14	10	9	11.33	3.55	2.01	4.991
Per. Gr. Bas.	17	18	18	17	24	19	17	16	11	3	18	13	15.92	5.14	2.91	4.275
Per. Gr. Leaf	31	40	24	36	30	32	48	31	48	32	37	37	35.50	7.17	4.05	7.229
Per. Gr. Total	48	58	42	53	54	51	65	47	59	35	55	50	51.42	7.97	4.51	7.440
Tree & shrub	14	32	6	0	11	9	17	17	17	30	14	21	15.67	9.13	5.16	9.357

H 2002													Mean	SD	95% CI	
Bare Ground	12	31	23	17	16	16	17	20	16	9	13	14	17.00	5.70	3.23	0.915
Rock	28	17	15	13	23	20	23	27	12	17	17	17	19.08	5.18	2.93	0.636
BG + Rock	40	48	38	30	39	36	40	47	28	26	30	31	36.08	7.20	4.08	0.824
Litter	28	13	11	15	16	25	15	6	19	16	12	12	15.67	6.04	3.41	0.118
Per. Gr. Bas.	3	5	2	2	2	6	0	3	3	5	3	10	3.67	2.57	1.45	0.786
Per. Gr. Leaf	6	22	11	21	2	12	12	12	10	21	26	29	15.33	8.28	4.69	0.154
Per. Gr. Total	9	27	13	23	4	18	12	15	13	26	29	39	19.00	9.96	5.64	0.209
Tree & shrub	18	7	22	30	11	23	18	20	27	22	34	30	21.83	7.86	4.45	0.008

H 2001													Mean	SD	95% CI	sigma
Bare Ground	19	16	16	15	14	7	29	14	21	16	17	17	16.75	5.12	2.90	5.412
Rock	17	21	18	18	17	10	28	28	25	18	25	16	20.08	5.43	3.08	5.306
BG + Rock	36	37	34	33	31	17	57	42	46	34	42	33	36.83	9.62	5.44	8.411
Litter	7	10	5	11	15	5	14	19	8	12	12	15	11.08	4.32	2.44	5.176
Per. Gr. Bas.	3	7	0	2	5	8	3	5	1	4	1	2	3.42	2.47	1.40	2.518
Per. Gr. Leaf	42	35	36	25	23	30	8	13	8	23	13	12	22.33	11.65	6.59	9.966
Per. Gr. Total	45	42	36	27	28	38	11	18	9	27	14	14	25.75	12.55	7.10	11.256
Tree & shrub	23	13	30	35	20	48	14	21	43	35	38	30	29.17	11.17	6.32	9.518

BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

G	2000	2001	2002
Bare Ground	22.3	14.0	23.8
Rock	14.6	8.4	13.8
BG + Rock	36.8	22.4	37.7
Litter	18 9	11.3	24.1
Per. Gr. Bas.	9.1	15.9	8.8
Per. Gr. Leaf	27.1	35.5	18.7
Per. Gr. Total	36.2	51.4	27.5
Tree & shrub	13.3	15.7	13.3

G 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

H	2000	2001	2002
Bare Ground	24.8	16.8	17.0
Rock	21.9	20.1	19.1
BG + Rock	46.8	36.8	36.1
Litter	12.9	11.1	15.7
Per. Gr. Bas.	5.7	3.4	3.7
Per. Gr. Leaf	15.0	22.3	15.3
Per. Gr. Total	20.7	25.8	19.0
Tree & shrub	23.9	29.2	21.8

H 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

I North 2002							Mean	SD
Bare Ground	12	16	11	16	24	20	16.500	4.889
Rock	7	14	14	7	10	28	13.333	7.840
BG + Rock	19	30	25	23	34	48	29.833	10.342
Litter	21	11	18	20	16	22	18.000	4.050
Per. Gr. Bas.	13	11	7	7	5	5	8.000	3.286
Per. Gr. Leaf	27	29	31	31	22	18	26.333	5.279
Per. Gr. Total	40	40	38	38	27	23	34.333	7.394
Tree & shrub cover	30	30	31	27	26	7	25.167	9.109

I South 2002							Mean	SD
Bare Ground	7	13	15	16	19	15	14.167	4.021
Rock	27	4	3	22	6	29	15.167	12.123
BG + Rock	34	17	18	38	25	44	29.333	11.057
Litter	19	22	21	19	13	22	19.333	3.386
Per. Gr. Bas.	11	4	16	6	9	7	8.833	4.262
Per. Gr. Leaf	30	27	36	21	28	21	27.167	5.707
Per. Gr. Total	41	31	52	27	37	28	36.000	9.508
Tree & shrub cover	6	38	29	21	40	4	23.000	15.518

J2 North 2002							Mean	SD
Bare Ground	26	23	25	17	29	36	26.000	6.325
Rock	16	27	16	13	13	23	18.000	5.727
BG + Rock	42	50	41	30	42	59	44.000	9.737
Litter	26	30	33	20	19	17	24.167	6.494
Per. Gr. Bas.	7	6	3	0	5	4	4.167	2.483
Per. Gr. Leaf	19	6	19	27	8	12	15.167	7.935
Per. Gr. Total	26	12	22	27	13	16	19.333	6.563
Tree & shrub cover	0	7	2	25	23	2	9.833	11.232

J2 South 2002							Mean	SD
Bare Ground	22	21	17	20	28	12	20.000	5.329
Rock	20	8	6	14	8	8	10.667	5.317
BG + Rock	42	29	23	34	36	20	30.667	8.287
Litter	29	25	20	18	21	16	21.500	4.764
Per. Gr. Bas.	9	11	6	9	8	10	8.833	1.722
Per. Gr. Leaf	12	18	22	25	21	32	21.667	6.713
Per. Gr. Total	21	29	28	34	29	42	30.500	7.007
Tree & shrub cover	10	19	43	31	17	31	25.167	12.007

K North 2002							Mean	SD
Bare Ground	20	36	20	32	27	21	26.000	6.841
Rock	31	14	25	19	16	9	19.000	7.925
BG + Rock	51	50	45	51	43	30	45.000	8.075
Litter	30	28	29	16	21	21	24.167	5.636
Per. Gr. Bas.	4	7	8	8	5	7	6.500	1.643
Per. Gr. Leaf	9	12	7	17	9	23	12.833	6.080

I west 2001 (maybe north)							Mean	SD	p value
Bare Ground	6	3	14	14	10	7	9.000	4.472	0.047
Rock	20	1	20	6	15	9	11.833	7.782	0.776
BG + Rock	26	4	34	20	25	16	20.833	10.245	0.250
Litter	11	5	8	5	5	11	7.500	2.950	0.000
Per. Gr. Bas.	11	19	9	19	13	15	14.333	4.131	0.032
Per. Gr. Leaf	43	42	37	35	31	44	38.667	5.164	0.013
Per. Gr. Total	54	61	46	54	44	59	53.000	6.812	0.005
Tree & shrub cover	8	53	29	8	33	10	23.500	18.185	0.818

I east 2001 (maybe south)							Mean	SD	p value
Bare Ground	13	15	8	15	15	18	14.000	3.347	0.935
Rock	7	13	8	15	10	28	13.500	7.714	0.714
BG + Rock	20	28	16	30	25	46	27.500	10.426	0.623
Litter	10	1	7	12	6	6	7.000	3.795	0.003
Per. Gr. Bas.	7	6	9	4	6	8	6.667	1.751	0.170
Per. Gr. Leaf	41	36	37	36	33	24	34.500	5.753	0.019
Per. Gr. Total	48	42	46	40	39	32	41.167	5.672	0.124
Tree & shrub cover	32	26	42	20	39	19	29.667	9.647	0.289

J2 North 2001							Mean	SD	p value
Bare Ground	24	25	15	17	25	26	22.000	4.733	0.111
Rock	8	16	25	6	17	12	14.000	6.899	0.298
BG + Rock	32	41	40	23	42	38	36.000	7.294	0.049
Litter	10	7	18	8	6	4	8.833	4.916	0.000
Per. Gr. Bas.	14	11	10	10	13	10	11.333	1.751	0.000
Per. Gr. Leaf	34	31	22	47	26	28	31.333	8.710	0.003
Per. Gr. Total	48	42	32	57	39	38	42.667	8.756	0.001
Tree & shrub cover	6	4	9	18	18	28	13.833	9.131	0.459

J2 south 2001							Mean	SD	p value
Bare Ground	16	12	7	8	10	4	9.500	4.183	0.002
Rock	16	2	7	7	4	6	7.000	4.817	0.026
BG + Rock	32	14	14	15	14	10	16.500	7.791	0.001
Litter	13	8	9	9	16	11	11.000	3.033	0.004
Per. Gr. Bas.	16	17	18	11	17	16	15.833	2.483	0.004
Per. Gr. Leaf	32	48	46	68	43	57	49.000	12.329	0.000
Per. Gr. Total	48	65	64	79	60	73	64.833	10.722	0.000
Tree & shrub cover	13	30	38	35	13	41	28.333	12.420	0.302

K north 2001							Mean	SD	p value
Bare Ground	16	23	15	20	12	20	17.667	4.033	0.016
Rock	32	20	13	40	12	17	22.333	11.255	0.501
BG + Rock	48	43	28	60	24	37	40.000	13.282	0.344
Litter	19	29	22	10	15	15	18.333	6.623	0.014
Per. Gr. Bas.	10	11	9	4	11	10	9.167	2.639	0.144
Per. Gr. Leaf	18	13	33	14	34	22	22.333	9.223	0.135

I 2002													Mean	SD	95% CI	
Bare Ground	12	16	11	16	24	20	7	13	15	16	19	15	15.33	4.44	2.51	0.080
Rock	7	14	14	7	10	28	27	4	3	22	6	29	14.25	9.78	5.53	0.624
BG + Rock	19	30	25	23	34	48	34	17	18	38	25	44	29.58	10.21	5.78	0.187
Litter	21	11	18	20	16	22	19	22	21	19	13	22	18.67	3.63	2.05	0.000
Per. Gr. Bas.	13	11	7	7	5	5	11	4	16	6	9	7	8.42	3.65	2.07	0.263
Per. Gr. Leaf	27	29	31	31	22	18	30	27	36	21	28	21	26.75	5.26	2.98	0.000
Per. Gr. Total	40	40	38	38	27	23	41	31	52	27	37	28	35.17	8.17	4.62	0.002
Tree & shrub	30	30	31	27	26	7	6	38	29	21	40	4	24.08	12.18	6.89	0.583

I 2001													Mean	SD	95% CI	sigma
Bare Ground	6	3	14	14	10	7	13	15	8	15	15	18	11.50	4.58	2.59	4.510
Rock	20	1	20	6	15	9	7	13	8	15	10	28	12.67	7.44	4.21	8.610
BG + Rock	26	4	34	20	25	16	20	28	16	30	25	46	24.17	10.45	5.91	10.331
Litter	11	5	8	5	5	11	10	1	7	12	6	6	7.25	3.25	1.84	3.439
Per. Gr. Bas.	11	19	9	19	13	15	7	6	9	4	6	8	10.50	5.02	2.84	4.336
Per. Gr. Leaf	43	42	37	35	31	44	41	36	37	36	33	24	36.58	5.65	3.20	5.454
Per. Gr. Total	54	61	46	54	44	59	48	42	46	40	39	32	47.08	8.60	4.86	8.382
Tree & shrub	8	53	29	8	33	10	32	26	42	20	39	19	26.58	14.25	8.06	13.216

J2 2002													Mean	SD	95% CI	
Bare Ground	26	23	25	17	29	36	22	21	17	20	28	12	23.00	6.40	3.62	0.001
Rock	16	27	16	13	13	23	20	8	6	14	8	8	14.33	6.51	3.69	0.049
BG + Rock	42	50	41	30	42	59	42	29	23	34	36	20	37.33	11.08	6.27	0.000
Litter	26	30	33	20	19	17	29	25	20	18	21	16	22.83	5.61	3.17	0.000
Per. Gr. Bas.	7	6	3	0	5	4	9	11	6	9	8	10	6.50	3.18	1.80	0.000
Per. Gr. Leaf	19	6	19	27	8	12	12	18	22	25	21	32	18.42	7.79	4.41	0.000
Per. Gr. Total	26	12	22	27	13	16	21	29	28	34	29	42	24.92	8.71	4.93	0.000
Tree & shrub	0	7	2	25	23	2	10	19	43	31	17	31	17.50	13.67	7.74	0.215

J2 2001													Mean	SD	95% CI	sigma
Bare Ground	24	25	15	17	25	26	16	12	7	8	10	4	15.75	7.79	4.41	7.095
Rock	8	16	25	6	17	12	16	2	7	7	4	6	10.50	6.75	3.82	6.631
BG + Rock	32	41	40	23	42	38	32	14	14	15	14	10	26.25	12.47	7.05	11.775
Litter	10	7	18	8	6	4	13	8	9	9	16	11	9.92	4.06	2.29	4.831
Per. Gr. Bas.	14	11	10	10	13	10	16	17	18	11	17	16	13.58	3.12	1.76	3.147
Per. Gr. Leaf	34	31	22	47	26	28	32	48	46	68	43	57	40.17	13.74	7.77	10.762
Per. Gr. Total	48	42	32	57	39	38	48	65	64	79	60	73	53.75	14.87	8.41	11.791
Tree & shrub	6	4	9	18	18	28	13	30	38	35	13	41	21.08	12.86	7.28	13.267

K 2002													Mean	SD	95% CI	
Bare Ground	20	36	20	32	27	21	27	12	24	22	28	20	24.08	6.37	3.61	0.012
Rock	31	14	25	19	16	9	16	23	15	15	12	13	17.33	6.20	3.51	0.776
BG + Rock	51	50	45	51	43	30	43	35	39	37	40	33	41.42	7.04	3.98	0.082
Litter	30	28	29	16	21	21	22	25	1	25	21	20	21.58	7.68	4.35	0.001
Per. Gr. Bas.	4	7	8	8	5	7	5	9	12	14	6	8	7.75	2.90	1.64	0.006
Per. Gr. Leaf	9	12	7	17	9	23	11	18	8	12	21	19	13.83	5.49	3.11	0.001

Year 2002

A west 2002. This plot was labeled B west in 20							Mean	SD
Bare Ground	7	9	7	7	10	8	8.000	1.265
Rock	15	7	10	16	13	4	10.833	4.708
BG + Rock	22	16	17	23	23	12	18.833	4.535
Litter	26	13	23	19	17	21	19.833	4.579
Per. Gr. Bas.	13	14	4	9	10	8	9.667	3.615
Per. Gr. Leaf	34	23	26	32	33	38	31.000	5.514
Per. Gr. Total	47	37	30	41	43	46	40.667	6.346
Tree & shrub cover	11	46	26	25	30	46	30.667	13.501

A east 2002. This plot was labeled B east in 200							Mean	SD
Bare Ground	10	14	14	15	11	19	13.833	3.189
Rock	17	10	13	20	13	20	15.500	4.135
BG + Rock	27	24	27	35	24	39	29.333	6.218
Litter	13	16	10	14	23	23	16.500	5.394
Per. Gr. Bas.	14	14	11	8	8	8	10.500	2.950
Per. Gr. Leaf	23	40	39	24	27	24	29.500	7.868
Per. Gr. Total	37	54	50	32	35	32	40.000	9.571
Tree & shrub cover	22	18	23	24	29	11	21.167	6.113

B- East 2002. This plot was labeled C east in 20							Mean	SD
Bare Ground	24	16	8	10	17	24	16.500	6.745
Rock	34	13	33	9	24	9	20.333	11.587
BG + Rock	58	29	41	19	41	33	36.833	13.243
Litter	13	9	22	17	18	15	15.667	4.457
Per. Gr. Bas.	15	17	8	12	12	13	12.833	3.061
Per. Gr. Leaf	11	26	14	41	22	27	23.500	10.710
Per. Gr. Total	26	43	22	53	34	40	36.333	11.431
Tree & shrub cover	4	32	13	22	16	25	18.667	9.832

B west 2002. This plot was labeled C west in 20							Mean	SD
Bare Ground	21	12	17	15	16	12	15.500	3.391
Rock	34	17	31	30	6	21	23.167	10.610
BG + Rock	55	29	48	45	22	33	38.667	12.628
Litter	9	33	22	17	19	29	21.500	8.620
Per. Gr. Bas.	0	13	4	13	2	17	8.167	7.026
Per. Gr. Leaf	23	9	21	12	23	9	16.167	6.882
Per. Gr. Total	23	22	25	25	25	26	24.333	1.506
Tree & shrub cover	13	17	5	12	35	14	16.000	10.119

C east 2002. This plot was labeled D east in 200							Mean	SD
Bare Ground	31	20	23	13	25	33	24.167	7.333
Rock	12	18	13	16	8	21	14.667	4.633
BG + Rock	43	38	36	29	33	54	38.833	8.796
Litter	14	26	16	29	19	15	19.833	6.242
Per. Gr. Bas.	8	11	16	7	5	6	8.833	4.070

Year 2001

A west 2001. This plot was called B in 2000. A							Mean	SD	p value
Bare Ground	6	4	17	9	7	7	8.333	4.546	0.883
Rock	19	5	21	15	29	3	15.333	9.913	0.199
BG + Rock	25	9	38	24	36	10	23.667	12.340	0.303
Litter	22	9	11	9	12	11	12.333	4.885	0.004
Per. Gr. Bas.	10	6	8	4	5	4	6.167	2.401	0.087
Per. Gr. Leaf	33	41	22	42	27	48	35.500	9.894	0.300
Per. Gr. Total	43	47	30	46	32	52	41.667	8.779	0.762
Tree & shrub cover	10	50	11	36	26	43	29.333	16.609	0.722

A east 2001.This plot was called B in 2000. A 2							Mean	SD	p value
Bare Ground	8	2	9	6	6	3	5.667	2.733	0.012
Rock	14	8	18	8	11	10	11.500	3.886	0.173
BG + Rock	22	10	27	14	17	13	17.167	6.306	0.031
Litter	9	1	9	11	7	9	7.667	3.502	0.025
Per. Gr. Bas.	13	25	19	11	21	15	17.333	5.279	0.023
Per. Gr. Leaf	37	45	38	41	46	49	42.667	4.761	0.020
Per. Gr. Total	50	70	57	52	67	64	60.000	8.222	0.005
Tree & shrub cover	22	59	17	43	21	38	33.333	16.256	0.195

B-East 2001							Mean	SD	p value
Bare Ground	26	19	15	12	16	19	17.833	4.792	0.455
Rock	23	24	6	28	6	19	17.667	9.480	0.739
BG + Rock	49	43	21	40	22	38	35.500	11.467	0.858
Litter	6	10	7	15	3	14	9.167	4.708	0.075
Per. Gr. Bas.	8	6	17	9	15	12	11.167	4.262	0.591
Per. Gr. Leaf	26	21	40	25	41	21	29.000	9.143	0.457
Per. Gr. Total	34	27	57	34	56	33	40.167	12.922	0.683
Tree & shrub cover	9	21	17	4	29	19	16.500	8.894	0.664

B west 2001							Mean	SD	p value
Bare Ground	12	8	13	12	6	10	10.167	2.714	0.011
Rock	27	8	24	15	9	14	16.167	7.782	0.032
BG + Rock	39	16	37	27	15	24	26.333	10.152	0.001
Litter	8	17	20	11	21	8	14.167	5.913	0.107
Per. Gr. Bas.	10	8	7	10	6	8	8.167	1.602	1.000
Per. Gr. Leaf	32	31	38	47	35	51	39.000	8.222	0.008
Per. Gr. Total	42	39	45	57	41	59	47.167	8.635	0.001
Tree & shrub cover	12	15	0	14	26	11	13.000	8.343	0.107

C east 2001							Mean	SD	p value
Bare Ground	19	28	17	21	17	22	20.667	4.131	0.392
Rock	17	15	24	12	11	19	16.333	4.803	0.512
BG + Rock	36	43	41	33	28	41	37.000	5.762	0.580
Litter	11	15	14	26	17	9	15.333	5.955	0.026
Per. Gr. Bas.	7	5	9	6	11	4	7.000	2.608	0.376

Watershed A 2002 1200 points													Mean	SD	95% CI	2001 vs.
Bare Ground	7	9	7	7	10	8	10	14	14	15	11	19	10.92	3.82	2.16	0.067
Rock	15	7	10	16	13	4	17	10	13	20	13	20	13.17	4.88	2.76	0.915
BG + Rock	22	16	17	23	23	12	27	24	27	35	24	39	24.08	7.55	4.27	0.354
Litter	26	13	23	19	17	21	13	16	10	14	23	23	18.17	5.08	2.87	0.000
Per. Gr. Bas.	13	14	4	9	10	8	14	14	11	8	8	8	10.08	3.18	1.80	0.425
Per. Gr. Leaf	34	23	26	32	33	38	23	40	39	24	27	24	30.25	6.52	3.69	0.012
Per. Gr. Total	47	37	30	41	43	46	37	54	50	32	35	32	40.33	7.75	4.38	0.018
Tree & shrub cc	11	46	26	25	30	46	22	18	23	24	29	11	25.92	11.16	6.31	0.273

A 2001. This plot was called B in 2000. A 2001 should be compared wi													Mean	SD	95% CI	sigma
Bare Ground	6	4	17	9	7	7	8	2	9	6	6	3	7.00	3.84	2.17	3.831
Rock	19	5	21	15	29	3	14	8	18	8	11	10	13.42	7.45	4.22	6.165
BG + Rock	25	9	38	24	36	10	22	10	27	14	17	13	20.42	9.94	5.62	8.745
Litter	22	9	11	9	12	11	9	1	9	11	7	9	10.00	4.73	2.68	4.904
Per. Gr. Bas.	10	6	8	4	5	4	13	25	19	11	21	15	11.75	7.02	3.97	5.098
Per. Gr. Leaf	33	41	22	42	27	48	37	45	38	41	46	49	39.08	8.30	4.69	7.410
Per. Gr. Total	43	47	30	46	32	52	50	70	57	52	67	64	50.83	12.55	7.10	10.148
Tree & shrub	10	50	11	36	26	43	22	59	17	43	21	38	31.33	15.81	8.94	13.482

B 2002													Mean	SD	95% CI	
Bare Ground	24	16	8	10	17	24	21	12	17	15	16	12	16.00	5.12	2.90	0.190
Rock	34	13	33	9	24	9	34	17	31	30	6	21	21.75	10.70	6.05	0.233
BG + Rock	58	29	41	19	41	33	55	29	48	45	22	33	37.75	12.37	7.00	0.103
Litter	13	9	22	17	18	15	9	33	22	17	19	29	18.58	7.22	4.08	0.011
Per. Gr. Bas.	15	17	8	12	12	13	0	13	4	13	2	17	10.50	5.71	3.23	0.677
Per. Gr. Leaf	11	26	14	41	22	27	23	9	21	12	23	9	19.83	9.40	5.32	0.015
Per. Gr. Total	26	43	22	53	34	40	23	22	25	25	25	26	30.33	9.98	5.65	0.029
Tree & shrub	4	32	13	22	16	25	13	17	5	12	35	14	17.33	9.61	5.44	0.297

B 2001													Mean	SD	95% CI	sigma
Bare Ground	26	19	15	12	16	19	12	8	13	12	6	10	14.00	5.46	3.09	5.289
Rock	23	24	6	28	6	19	27	8	24	15	9	14	16.92	8.31	4.70	9.501
BG + Rock	49	43	21	40	22	38	39	16	37	27	15	24	30.92	11.38	6.44	11.878
Litter	6	10	7	15	3	14	8	17	20	11	21	8	11.67	5.73	3.24	6.471
Per. Gr. Bas.	8	6	17	9	15	12	10	8	7	10	6	8	9.67	3.45	1.95	4.580
Per. Gr. Leaf	26	21	40	25	41	21	32	31	38	47	35	51	34.00	9.80	5.54	9.598
Per. Gr. Total	34	27	57	34	56	33	42	39	45	57	41	59	43.67	11.10	6.28	10.541
Tree & shrub	9	21	17	4	29	19	12	15	0	14	26	11	14.75	8.42	4.77	9.018

C 2002 This plot was labeled D east in 2000. Converted to C in 2001													Mean	SD	95% CI	
Bare Ground	31	20	23	13	25	33	23	18	19	11	17	12	20.42	7.00	3.96	0.281
Rock	12	18	13	16	8	21	23	15	15	20	15	23	16.58	4.58	2.59	0.366
BG + Rock	43	38	36	29	33	54	46	33	34	31	32	35	37.00	7.25	4.10	0.048
Litter	14	26	16	29	19	15	24	44	24	20	23	20	22.83	8.07	4.56	0.002
Per. Gr. Bas.	8	11	16	7	5	6	6	8	3	18	10	9	8.92	4.38	2.48	0.143

I	2000	2001	2002
Bare Ground	18.5	11.5	15.3
Rock	16.1	12.7	14.3
BG + Rock	34.6	24.2	29.6
Litter	12.3	7.3	18.7
Per. Gr. Bas.	10.0	10.5	8.4
Per. Gr. Leaf	30.3	36.6	26.8
Per. Gr. Total	40.3	47.1	35.2
Tree & shrub	19.8	26.6	24.1

I 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

J2	2000	2001	2002
Bare Ground	23.6	15.8	23.0
Rock	13.3	10.5	14.3
BG + Rock	36.8	26.3	37.3
Litter	9.8	9.9	22.8
Per. Gr. Bas.	12.3	13.6	6.5
Per. Gr. Leaf	29.3	40.2	18.4
Per. Gr. Total	41.7	53.8	24.9
Tree & shrub	18.9	21.1	17.5

J2 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

K	2000	2001	2002
Bare Ground	21.8	17.3	24.1
Rock	14.3	18.1	17.3
BG + Rock	36.2	35.4	41.4
Litter	11.4	13.4	21.6
Per. Gr. Bas.	10.8	12.3	7.8
Per. Gr. Leaf	30.8	27.6	13.8

Per. Gr. Total	13	19	15	25	14	30	19.333	6.831
Tree & shrub cover	0	6	10	4	20	18	9.667	7.941

K south 2002							Mean	SD
Bare Ground	27	12	24	22	28	20	22.167	5.811
Rock	16	23	15	15	12	13	15.667	3.882
BG + Rock	43	35	39	37	40	33	37.833	3.601
Litter	22	25	1	25	21	20	19.000	9.055
Per. Gr. Bas.	5	9	12	14	6	8	9.000	3.464
Per. Gr. Leaf	11	18	8	12	21	19	14.833	5.193
Per. Gr. Total	16	27	20	26	27	27	23.833	4.708
Tree & shrub cover	24	21	10	13	14	30	18.667	7.623

M North 2002							Mean	SD
Bare Ground	35	26	26	37	28	9	26.833	9.908
Rock	13	13	3	5	12	7	8.833	4.401
BG + Rock	48	39	29	42	40	16	35.667	11.431
Litter	20	17	23	23	22	32	22.833	5.037
Per. Gr. Bas.	2	6	4	13	2	11	6.333	4.676
Per. Gr. Leaf	12	15	15	9	23	17	15.167	4.750
Per. Gr. Total	14	21	19	22	25	28	21.500	4.848
Tree & shrub cover	23	28	39	9	15	36	25.000	11.713

M south 2002							Mean	SD
Bare Ground	19	22	24	19	35	10	21.500	8.167
Rock	11	7	9	5	10	1	7.167	3.710
BG + Rock	30	29	33	24	45	11	28.667	11.147
Litter	35	9	25	15	27	12	20.500	10.075
Per. Gr. Bas.	12	11	6	11	2	8	8.333	3.830
Per. Gr. Leaf	4	22	9	22	9	32	16.333	10.671
Per. Gr. Total	16	33	15	33	11	40	24.667	12.078
Tree & shrub cover	20	37	27	27	17	74	33.667	20.935

N east 2002. This plot was not resampled in 200							Mean	SD
Bare Ground	22	19	20	26	10	7	17.333	7.312
Rock	11	1	2	1	5	5	4.167	3.817
BG + Rock	33	20	22	27	15	12	21.500	7.714
Litter	36	29	45	33	31	34	34.667	5.610
Per. Gr. Bas.	9	11	7	5	4	3	6.500	3.082
Per. Gr. Leaf	10	27	18	16	18	11	16.667	6.121
Per. Gr. Total	19	38	25	21	22	14	23.167	8.134
Tree & shrub cover	12	15	6	25	45	42	24.167	16.216

N west 2002. This plot was not resampled in 20(							Mean	SD
Bare Ground	28	22	23	12	15	31	21.833	7.305
Rock	5	5	7	5	2	3	4.500	1.761
BG + Rock	33	27	30	17	17	34	26.333	7.633

Per. Gr. Total	28	24	42	18	45	32	31.500	10.426	0.101
Tree & shrub cover	1	1	12	2	19	20	9.167	9.020	0.673

K south 2001							Mean	SD	p value
Bare Ground	13	12	35	8	17	17	17.000	9.445	0.254
Rock	13	13	17	21	7	12	13.833	4.750	0.456
BG + Rock	26	25	52	29	24	29	30.833	10.572	0.178
Litter	7	12	3	6	12	11	8.500	3.728	0.016
Per. Gr. Bas.	11	22	11	22	16	11	15.500	5.394	0.025
Per. Gr. Leaf	30	39	25	34	26	43	32.833	7.195	0.001
Per. Gr. Total	41	61	36	56	42	54	48.333	9.973	0.001
Tree & shrub cover	34	7	8	25	25	18	19.500	10.597	0.870

M north 2001							Mean	SD	p value
Bare Ground	12	13	18	14	18	10	14.167	3.251	0.020
Rock	6	3	4	8	6	9	6.000	2.280	0.262
BG + Rock	18	16	22	22	24	19	20.167	2.994	0.024
Litter	22	8	22	16	14	12	15.667	5.574	0.070
Per. Gr. Bas.	11	11	4	12	13	14	10.833	3.545	0.070
Per. Gr. Leaf	35	46	24	36	34	44	36.500	7.893	0.002
Per. Gr. Total	46	57	28	48	47	58	47.333	10.801	0.001
Tree & shrub cover	17	38	43	25	17	32	28.667	10.857	0.330

M south 2001							Mean	SD	p value
Bare Ground	13	9	2	12	28	5	11.500	9.094	0.013
Rock	7	18	4	9	9	7	9.000	4.775	0.504
BG + Rock	20	27	6	21	37	12	20.500	10.932	0.104
Litter	12	19	13	24	12	22	17.000	5.367	0.589
Per. Gr. Bas.	8	11	22	7	8	6	10.333	5.955	0.557
Per. Gr. Leaf	39	10	48	19	28	16	26.667	14.556	0.340
Per. Gr. Total	47	21	70	26	36	22	37.000	18.931	0.346
Tree & shrub cover	24	38	28	29	21	54	32.333	12.078	0.738

N east 2001. This is the first year for this plot t							Mean	SD	p value
Bare Ground	21	15	33	11	20	5	17.500	9.628	0.969
Rock	8	2	5	8	2	4	4.833	2.714	0.691
BG + Rock	29	17	38	19	22	9	22.333	10.073	0.828
Litter	38	19	36	20	37	24	29.000	8.944	0.132
Per. Gr. Bas.	6	21	9	11	10	15	12.000	5.292	0.056
Per. Gr. Leaf	22	26	13	17	7	30	19.167	8.519	0.605
Per. Gr. Total	28	47	22	28	17	45	31.167	12.222	0.187
Tree & shrub cover	5	20	0	37	28	34	20.667	15.306	

N west 2001.This is the first year for this plot t							Mean	SD	p value
Bare Ground	23	23	12	10	12	15	15.833	5.776	0.068
Rock	7	11	4	3	7	2	5.667	3.327	0.482
BG + Rock	30	34	16	13	19	17	21.500	8.456	0.254

Per. Gr. Total	13	19	15	25	14	30	16	27	20	26	27	27	21.58	6.07	3.43	0.000
Tree & shrub	0	6	10	4	20	18	24	21	10	13	14	30	14.17	8.79	4.97	0.945

K 2001													Mean	SD	95% CI	sigma
Bare Ground	16	23	15	20	12	20	13	12	35	8	17	17	17.33	6.93	3.92	6.653
Rock	32	20	13	40	12	17	13	13	17	21	7	12	18.08	9.36	5.29	7.777
BG + Rock	48	43	28	60	24	37	26	25	52	29	24	29	35.42	12.41	7.02	9.722
Litter	19	29	22	10	15	15	7	12	3	6	12	11	13.42	7.25	4.10	7.468
Per. Gr. Bas.	10	11	9	4	11	10	11	22	11	22	16	11	12.33	5.23	2.96	4.062
Per. Gr. Leaf	18	13	33	14	34	22	30	39	25	34	26	43	27.58	9.61	5.43	7.548
Per. Gr. Total	28	24	42	18	45	32	41	61	36	56	42	54	39.92	13.11	7.42	9.589
Tree & shrub	1	1	12	2	19	20	34	7	8	25	25	18	14.33	10.82	6.12	9.806

M 2002													Mean	SD	95% CI	
Bare Ground	35	26	26	37	28	9	19	22	24	19	35	10	24.17	9.09	5.15	0.000
Rock	13	13	3	5	12	7	11	7	9	5	10	1	8.00	3.98	2.25	0.782
BG + Rock	48	39	29	42	40	16	30	29	33	24	45	11	32.17	11.37	6.43	0.004
Litter	20	17	23	23	22	32	35	9	25	15	27	12	21.67	7.69	4.35	0.134
Per. Gr. Bas.	2	6	4	13	2	11	12	11	6	11	2	8	7.33	4.21	2.38	0.102
Per. Gr. Leaf	12	15	15	9	23	17	4	22	9	22	9	32	15.75	7.90	4.47	0.012
Per. Gr. Total	14	21	19	22	25	28	16	33	15	33	11	40	23.08	8.93	5.05	0.011
Tree & shrub	23	28	39	9	15	36	20	37	27	27	17	74	29.33	16.79	9.50	0.655

M 2001													Mean	SD	95% CI	sigma
Bare Ground	12	13	18	14	18	10	13	9	2	12	28	5	12.83	6.66	3.77	7.876
Rock	6	3	4	8	6	9	7	18	4	9	9	7	7.50	3.90	2.20	3.937
BG + Rock	18	16	22	22	24	19	20	27	6	21	37	12	20.33	7.64	4.32	9.506
Litter	22	8	22	16	14	12	12	19	13	24	12	22	16.33	5.26	2.98	6.477
Per. Gr. Bas.	11	11	4	12	13	14	8	11	22	7	8	6	10.58	4.68	2.65	4.443
Per. Gr. Leaf	35	46	24	36	34	44	39	10	48	19	28	16	31.58	12.29	6.95	10.093
Per. Gr. Total	46	57	28	48	47	58	47	21	70	26	36	22	42.17	15.65	8.86	12.292
Tree & shrub	17	38	43	25	17	32	24	38	28	29	21	54	30.50	11.12	6.29	13.955

N 2002													Mean	SD	95% CI	
Bare Ground	22	19	20	26	10	7	28	22	23	12	15	31	19.58	7.35	4.16	0.269
Rock	11	1	2	1	5	5	5	5	7	5	2	3	4.33	2.84	1.61	0.403
BG + Rock	33	20	22	27	15	12	33	27	30	17	17	34	23.92	7.74	4.38	0.464
Litter	36	29	45	33	31	34	36	21	41	54	43	30	36.08	8.67	4.91	0.003
Per. Gr. Bas.	9	11	7	5	4	3	2	10	0	6	15	5	6.42	4.23	2.39	0.011
Per. Gr. Leaf	10	27	18	16	18	11	20	15	14	19	9	18	16.25	4.97	2.81	0.250
Per. Gr. Total	19	38	25	21	22	14	22	25	14	25	24	23	22.67	6.18	3.50	0.879
Tree & shrub	12	15	6	25	45	42	12	39	14	3	18	14	20.42	14.16	8.01	0.741

N 2001. This is the first year for this plot to be sampled.													Mean	SD	95% CI
Bare Ground	21	15	33	11	20	5	23	23	12	10	12	15	16.67	7.62	4.31
Rock	8	2	5	8	2	4	7	11	4	3	7	2	5.25	2.93	1.66
BG + Rock	29	17	38	19	22	9	30	34	16	13	19	17	21.92	8.88	5.02

Litter	36	21	41	54	43	30	37.500	11.362
Per. Gr. Bas.	2	10	0	6	15	5	6.333	5.465
Per. Gr. Leaf	20	15	14	19	9	18	15.833	4.070
Per. Gr. Total	22	25	14	25	24	23	22.167	4.167
Tree & shrub cover	12	39	14	3	18	14	16.667	12.028

Litter	23	15	25	18	20	15	19.333	4.131	0.008
Per. Gr. Bas.	14	11	10	8	10	12	10.833	2.041	0.143
Per. Gr. Leaf	28	0	0	0	0	0	4.667	11.431	0.041
Per. Gr. Total	42	11	10	8	10	12	15.500	13.050	0.290
Tree & shrub cover	7	11	28	43	14	40	23.833	15.433	

Litter	38	19	36	20	37	24	23	15	25	18	20	15	24.17	8.34	4.72
Per. Gr. Bas.	6	21	9	11	10	15	14	11	10	8	10	12	11.42	3.87	2.19
Per. Gr. Leaf	22	26	13	17	7	30	28	0	0	0	0	0	11.92	12.24	6.92
Per. Gr. Total	28	47	22	28	17	45	42	11	10	8	10	12	23.33	14.57	8.24
Tree & shrub	5	20	0	37	28	34	7	11	28	43	14	40	22.25	14.75	8.34

Per. Gr. Total	41.7	39.9	21.6
Tree & shrub	16.7	14.3	14.2

K 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

M	2000	2001	2002
Bare Ground	19.6	12.8	24.2
Rock	9.2	7.5	8.0
BG + Rock	28.8	20.3	32.2
Litter	14.2	16.3	21.7
Per. Gr. Bas.	10.2	10.6	7.3
Per. Gr. Leaf	36.0	31.6	15.8
Per. Gr. Total	46.2	42.2	23.1
Tree & shrub	20.8	30.5	29.3

M 2001
Bare Ground
Rock
BG + Rock
Litter
Per. Gr. Bas.
Per. Gr. Leaf
Per. Gr. Total
Tree & shrub cover

N	2001	2002
Bare Ground	16.7	19.6
Rock	5.3	4.4
BG + Rock	21.9	23.9

Litter	24.2	36.1
Per. Gr. Bas.	11.4	6.5
Per. Gr. Leaf	11.9	16.2
Per. Gr. Total	23.3	22.7
Tree & shrub	22.3	20.5

Vegetation Sampling Report for USFS Cascabel Ranch Watershed Research Study Year 2001

Submitted by
Myles B. Traphagen
910 L St.
Davis, CA 95616
(520) 991-6368

May 31, 2001

Table of Contents

Site Description ____ 2

Relocation of watershed N ____ 2

Marking of plots ____ 3

Photo-points ____ 3

CD-ROM Data Disc ____ 3

Data analysis ____ 4

Table 1 ____ 5

Description of Chart Data ____ 6

Literature Cited ____ 7

Appendix A
Charts and Graphs

Appendix B
2000 vs. 2001 t-test results

Appendix C
Transect data used for analysis

Appendix D
GPS and marking tag numbers

Figure 1
Diagram of photo-point and tag locations

Introduction

Between the dates of October 1, 2001 and October 14, 2001 a second year of baseline vegetation data was collected at the Cascabel watershed research site. Several improvements were also made to the project, notably the establishment of photo stations and permanent markers for each transect. GPS readings for each plot were also taken. Errors in plot placement were discovered from 2000 and these were corrected. This will be discussed in greater detail below.

Nine of eleven plots re-sampled experienced significant decreases in the amount of bare ground cover. Five of eleven plots showed statistically significant increases in perennial grass cover from year 2000 to 2001. No measurable decreases in perennial grass cover occurred in any plot. Tree and shrub cover increases occurred in five of eleven plots. However, this is more likely a product of the sampling design than an actual change in cover. This will be discussed in further detail below.

Site Description

The research site lies immediately north of Whitmire Canyon on the eastern edge of the Peloncillo Mountains in New Mexico, approximately 20 miles south of Animas, New Mexico. It is bordered on the east by the Animas Valley. Elevation is approximately 5400 feet. The site lies in the Madrean biogeographic province and the vegetation is classified as Madrean Evergreen Woodland (Brown & Lowe, 1978). Dominant overstory species include Emory oak (*Quercus emoryii*), Gray oak (*Quercus grisea*), Alligator juniper (*Juniperus deppiana*) and Mexican pinyon (*Pinus cembroides*). Shrubs include Skunkbush sumac (*Rhus trilobata*), Wright's silktassel (*Garrya wrightii*), Schott yucca (*Yucca schotti*), Palmer agave (*Agave palmeri*), manzanita (*Arctostapylos hookeri*) and beargrass (*Nolina microphylla*). Several small cacti are also found throughout the site. Perennial grasses are abundant. Of particular note is the dominant presence of purple grama (*Bouteloua radicosa*), which was found in every plot. Other grasses common to virtually every plot are little bluestem (*Schizachrium cirratum*), bull muhly (*Muhlenbergia emersleyi*), blue grama *(Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*) and wolftail (*Lycurus pheloides*).

A central ridge divides the drainages of Whitmire and Walnut Creeks. An access lies atop this ridge that allows for access to twelve plots. Six plots lie north of the ridge and drain into Walnut Creek, and the remaining six are south of the ridge and drain into Whitmire Creek. The terrain consists of moderate to steep canyons of about 100 to 400 feet in depth, with the plots lying within these canyons. A great deal of rock is exposed, and soil depths are shallow within the canyons.

Relocation of watershed N

Watershed N, located on the eastern end of the study plot near the National Forest boundary, was relocated. The problem lay in the fact that N was located within the same watershed as M. Watershed M covers a wide area of gentle topographic relief. Several stream channels separated by low ridges parallel one another before meeting up at the flume. If one does not trace the course of the watershed from the flume going upstream, then they could easily mistake each one of these stream channels for being its own distinct watershed. Stakes were pulled up for N and moved further east into the correct watershed. Therefore, 2001 is the first year of data collection for watershed N.

Marking of plots

Twelve transects are located within each plot. The beginning of each transect lies approximately 1 to 2 meters above the stream bottom. Each transect was marked using permanent marking materials. A 10 inch steel spike was driven into the ground and an aluminum tag was attached to the spike. Approximately 3 or 4 inches of the spike is exposed above the ground surface with the remaining 6 to 7 inches driven securely into the ground. They appear sturdy enough to survive a flood or fire event and to withstand trampling by livestock. The tags are numbered sequentially from 1 to 148. Tags 96, 97, 98 and 99 were not used to mark any transects. The tag numbers correspond to the photo-point and GPS numbers in the GPS/Photo-point log located in Appendix D. This will ensure more precise data collection by allowing more accurate transect placement in successive years. Repeat photography will be more easily facilitated, too. The integrity of the tags should be inspected annually during data collection. Below is the part number for the tags, available through Forestry Suppliers.

Round aluminum tags, page 15 of catalog 52.
Item: 79366 (#'s 1-100). $9.75
Available in numbers 1 through 1000.

GPS Coordinates

GPS coordinates were taken at each plot using a Garmin GPS II+. Readings are in UTM projection using map datum WGS 84. Estimated position error was calculated at 3 meters. Four readings were taken in each plot. See Figure 1 for description of where readings are taken in each plot. The UTM coordinates, and their corresponding tag numbers are located in Appendix D.

Photo-points

Photos were taken using a 35mm Canon Elan IIe loaded with Kodak Royal Gold 100 print film. Royal Gold 100 is the finest grade print film available. The choice of using print film was based on cost, ease of processing, and instant access for viewing. Repeat photography is also much more accurate when using prints in the field to match up the shots. Photos were scanned to CD-ROM so that they can be easily accessed and used for presentations, such as Power Point. Each plot received twelve photos. The shots were taken from the beginning of the transect where the marker tag was located. The direction of the shot is taken looking straight up the transect going uphill. See Figure 1 for diagram of photo-points within the plot.

CD-ROM Data Disc

Data entered into Excel spreadsheets are available on the CD-ROM disc included in this report. Raw data are located in a folder titled "*Cascabel Data 2001.*" The raw data from 2000 are also on this disc in a folder titled "*Cascabel data 2000.*" The folder that will most likely be of greatest use lies within a folder titled "*Cascabel 2001 Report*," and is titled "2000 vs. 2001." This is a workbook in an Excel spreadsheet that contains the dissertation of the major categories of variables measured. It is a detailed analysis of the figures presented in Table 1, *Changes in % Cover 2000 vs. 2001.* The charts presented in this report are also contained in the same workbook.

The photo-points are included on the CD in two formats, large and small. The small format contains JPEG images of approximately 200k. Large format JPEG images are about 900k. The two different formats are presented so that they can be used in an appropriate context. For example, the small format would be appropriate for uploading images to the Rocky Mountain Research Station web site so that images load more quickly. The large format would allow for better images if they were printed on photo quality print paper.

Description of plots

There are 12 watersheds on the research site and each watershed contains 12 transects of 50 meters in length. All watersheds have either west-east or north-south aspects, therefore six transects were placed on either side of the watershed so that both aspects could be captured. Year 2000 data showed that slope aspect caused no significant difference in vegetation composition on either side of the watershed. The area sampled is approximately 1 hectare per watershed. The transects start about 2m up from the bottom of each side of the drainage and extend towards the top of the watershed (see Figure 1). One hundred points per transect are taken using the point intercept method (Bonham, 1989) to measure cover. Each watershed contains a total of 1200 points. Detailed descriptions describing methodology and monitoring concepts are found in the Cascabel 2000 report.

Data analysis

The transect is treated as the sample unit. Therefore each plot has a sample size (n) of 12. When a high degree of variability exists within a plot, it is appropriate to use the transect as the sample unit versus individual points (Elzinga , 1998).

Years 2000 and 2001 were compared using a paired samples t-test. This test is also known as a correlated or dependent samples t-test. This statistical test was chosen because, given the fact that the same transects are re-sampled, the two sample means are therefore related (or correlated) to each other. The formula for the paired samples t-test is given by

$$t = \frac{\overline{D} - \mu_D}{S_{\overline{D}}}$$

where $\overline{D}$ is the sample mean difference score, μ_D is the hypothesized population mean difference, and $S_{\overline{D}}$ is the standard error of the difference (Dretze & Heilman, 1998).

Testing was conducted for the following categories described below that are charted in Appendix A. Table 1, below, serves as a quick reference for understanding the changes in cover that took place between 2000 and 2001. Appendix B contains the p- values and confidence intervals for the table below as well as for the information found in the charts of Appendix A. Appendix C contains the raw data set used for the analyses.

A-east
########

	7	8	9	10	11	12	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	10	14	14	15	11	19	13.8%
Rock	17	10	13	20	13	20	15.5%
LITTER	13	16	10	14	23	23	16.5%
FORB	0	1	2	1	1	0	0.8%
SCCI basa	6	4	6	3	4	0	3.8%
" leaf	10	18	20	11	15	14	14.7%
BOHI	0	0	0	0	0	0	0.0%
" leaf	2	0	1	0	0	2	0.8%
LYPH	0	0	0	0	0	1	0.2%
" leaf	0	1	0	0	0	0	0.2%
BOCU	0	0	0	1	0	2	0.5%
" leaf	2	5	0	2	0	2	1.8%
MUEM	2	7	2	3	0	2	2.7%
" leaf	4	8	4	3	4	5	4.7%
BORAD	5	3	2	1	4	2	2.8%
" leaf	2	5	5	5	7	1	4.2%
ERIN	0	0	0	0	0	1	0.2%
" leaf	0	0	0	1	0	0	0.2%
ARIST	1	0	1	0	0	0	0.3%
" leaf	3	3	9	2	1	0	3.0%
BOBA	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
NOMI	4	8	11	13	11	3	8.3%
QUERCUS	0	10	7	5	9	6	6.2%
JUDE	0	0	2	6	1	0	1.5%
ERWR	0	0	1	0	0	0	0.2%
Agave	0	0	3	0	1	0	0.7%
Manzanita	17	0	0	0	5	1	3.8%
MIDY	0	0	0	0	1	0	0.2%
YUBA	0	0	0	0	1	0	0.2%
Sotol	1	0	0	0	0	0	0.2%
Pinyon	0	0	0	0	0	1	0.2%

							Mean	SD
Bare Ground	10	14	14	15	11	19	13.83	3.19
Rock	17	10	13	20	13	20	15.50	4.14
BG + Rock	27	24	27	35	24	39	29.33	6.22
Litter	13	16	10	14	23	23	16.50	5.39
Per. Gr. Bas.	14	14	11	8	8	8	10.50	2.95
Per. Gr. Leaf	23	40	39	24	27	24	29.50	7.87

Per. Gr. Total	37	54	50	32	35	32	40.00	9.57
Tree & shrub	22	18	23	24	29	11	21.17	6.11

A West
########

Cover	0m	1 20m	2 40m	3 60m	4 80m	5 100m	6	Total Cover
Soil		7	9	7	7	10	8	8.0%
Rock		15	7	10	16	13	4	10.8%
LITTER		26	13	23	19	17	21	19.8%
FORB		0	5	2	4	1	1	2.2%
SCCI basa		6	10	1	4	5	2	4.7%
" leaf		20	15	11	18	18	10	15.3%
BOHI		1	0	0	1	0	0	0.3%
" leaf		1	0	0	1	3	0	0.8%
BORAD		3	2	1	3	1	1	1.8%
" leaf		4	1	5	9	4	2	4.2%
LYPH		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
BOCU		2	1	1	1	2	3	1.7%
" leaf		7	1	4	2	3	19	6.0%
MUEM		1	0	0	0	1	2	0.7%
" leaf		2	3	5	2	0	2	2.3%
BOGR		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
ERIN		0	0	0	0	0	0	0.0%
" leaf		0	1	1	0	0	0	0.3%
ARIST		0	1	1	0	1	0	0.5%
" leaf		0	2	0	0	5	5	2.0%
BOBA		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
NOMI		3	16	12	9	17	8	10.8%
QUERCUS		0	14	0	11	2	30	9.5%
JUDE		7	15	4	0	11	3	6.7%
Agave		0	1	0	0	0	1	0.3%
Ann grass		1	0	5	0	1	0	1.2%
JUMO		0	0	9	0	0	0	1.5%
Manzanita		0	0	1	5	0	1	1.2%
Pinyon		0	0	0	0	0	2	0.3%
YUBA		0	0	0	0	0	1	0.2%
Sotol		1	0	0	0	0	0	0.2%

							Mean	SD
Bare Ground	7	9	7	7	10	8	8.00	1.26
Rock	15	7	10	16	13	4	10.83	4.71
BG + Rock	22	16	17	23	23	12	18.83	4.54
Litter	26	13	23	19	17	21	19.83	4.58

Per. Gr. Bas.	13	14	4	9	10	8	9.67	3.61
Per. Gr. Leaf	34	23	26	32	33	38	31.00	5.51
Per. Gr. Total	47	37	30	41	43	46	40.67	6.35
Tree & shrub	11	46	26	25	30	46	30.67	13.50

B East
########

Cover	0m	125 20m	126 40m	127 60m	128 80m	129 100m	130	Total Cover
Soil		24	16	8	10	17	24	16.5%
Rock		34	13	33	9	24	9	20.3%
LITTER		13	9	22	17	18	15	15.7%
FORB		2	1	1	0	1	1	1.0%
SCCI basa		2	3	3	4	1	4	2.8%
" leaf		7	11	5	21	6	9	9.8%
BOHI		1	0	1	0	0	0	0.3%
" leaf		0	2	0	2	1	2	1.2%
BORAD		6	7	1	6	7	5	5.3%
" leaf		2	4	3	8	2	6	4.2%
LYPH		1	0	0	0	0	0	0.2%
" leaf		0	1	0	0	0	0	0.2%
BOCU		2	0	0	1	1	0	0.7%
" leaf		2	2	0	3	6	0	2.2%
MUEM		1	4	2	1	1	2	1.8%
" leaf		0	3	2	2	1	2	1.7%
BOGR		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
ERIN		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
NOMI		2	16	13	12	1	10	9.0%
Quercus		0	7	0	2	11	12	5.3%
Agave		2	3	0	0	1	1	1.2%
Aristida		2	0	1	0	2	2	1.2%
"leaf		0	3	4	5	2	8	3.7%
JUDE		0	6	0	8	3	0	2.8%
HIBE		0	3	0	0	0	0	0.5%
"leaf		0	0	0	0	4	0	0.7%
Manzanita		0	0	0	0	0	1	0.2%
MIDY		0	0	0	0	0	1	0.2%

							Mean	SD
Bare Ground	24	16	8	10	17	24	16.50	6.75
Rock	34	13	33	9	24	9	20.33	11.59
BG + Rock	58	29	41	19	41	33	36.83	13.24
Litter	13	9	22	17	18	15	15.67	4.46
Per. Gr. Bas.	15	17	8	12	12	13	12.83	3.06
Per. Gr. Leaf	11	26	14	41	22	27	23.50	10.71
Per. Gr. Total	26	43	22	53	34	40	36.33	11.43
Tree & shrub	4	32	13	22	16	25	18.67	9.83

B West
########

Cover	0m	131 20m	132 40m	133 60m	134 80m	135 100m	136	Total Cover
Soil		21	12	17	15	16	12	15.5%
Rock		34	17	31	30	6	21	23.2%
LITTER		9	33	22	17	19	29	21.5%
FORB		3	0	2	0	4	0	1.5%
SCCI basa		0	5	1	8	2	5	3.5%
" leaf		11	4	10	3	11	4	7.2%
BOHI		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
BORAD		0	8	1	4	0	9	3.7%
" leaf		8	5	9	3	5	3	5.5%
LYPH		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
BOCU		0	0	1	0	0	3	0.7%
" leaf		1	0	2	5	6	1	2.5%
MUEM		0	0	1	1	0	0	0.3%
" leaf		3	0	0	1	0	1	0.8%
BOGR		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
ERIN		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
NOMI		10	14	4	10	26	14	13.0%
Quercus		0	0	0	0	6	0	1.0%
JUDE		3	0	0	2	0	0	0.8%
YUSC		0	2	0	0	3	0	0.8%
AGAVE		0	1	1	0	0	0	0.3%
Grass		0	0	0	2	1	0	0.5%
DICA		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	1	0	0.2%

-							Mean	SD
Bare Ground	21	12	17	15	16	12	15.50	3.39
Rock	34	17	31	30	6	21	23.17	10.61
BG + Rock	55	29	48	45	22	33	38.67	12.63
Litter	9	33	22	17	19	29	21.50	8.62
Per. Gr. Bas.	0	13	4	13	2	17	8.17	7.03
Per. Gr. Leaf	23	9	21	12	23	9	16.17	6.88
Per. Gr. Total	23	22	25	25	25	26	24.33	1.51
Tree & shrub	13	17	5	12	35	14	16.00	10.12

C East
########

	37	38	39	40	41	42	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	31	20	23	13	25	33	24.2%
Rock	12	18	13	16	8	21	14.7%
LITTER	14	26	16	29	19	15	19.8%
FORB	1	0	1	0	8	1	1.8%
SCCI basa	3	3	4	5	3	3	3.5%
" leaf	13	6	15	6	9	8	9.5%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BORAD	2	2	4	0	2	3	2.2%
" leaf	6	3	3	2	4	1	3.2%
LYPH	0	0	0	0	0	0	0.0%
" leaf	1	0	0	0	0	0	0.2%
BOCU	0	1	0	0	0	0	0.2%
" leaf	4	0	1	0	1	0	1.0%
MUEM	2	3	2	1	0	0	1.3%
" leaf	0	2	5	0	0	0	1.2%
BOGR	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	1	2	1	0.7%
ARIST	1	2	2	1	0	0	1.0%
" leaf	5	8	8	2	2	4	4.8%
NOMI	2	0	0	6	8	6	3.7%
QUERCUS	4	7	7	11	4	5	6.3%
JUDE	0	0	0	0	8	0	1.3%
ERWR	2	2	0	0	0	0	0.7%
MIDY	4	0	2	0	0	0	1.0%
Agave	1	0	0	0	0	0	0.2%
YUSC	0	1	0	0	2	1	0.7%
PIFI	0	0	4	0	0	0	0.7%
" leaf	0	0	0	0	0	0	0.0%
Grass	0	0	0	0	4	0	0.7%

							Mean	SD
Bare Ground	31	20	23	13	25	33	24.17	7.33
Rock	12	18	13	16	8	21	14.67	4.63
BG + Rock	43	38	36	29	33	54	38.83	8.80
Litter	14	26	16	29	19	15	19.83	6.24
Per. Gr. Bas.	8	11	16	7	5	6	8.83	4.07
Per. Gr. Leaf	29	19	32	11	18	14	20.50	8.31
Per. Gr. Total	37	30	48	18	23	20	29.33	11.52

C West
########

	43	44	45	46	47	48	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	23	18	19	11	17	12	16.7%
Rock	23	15	15	20	15	23	18.5%
LITTER	24	44	24	20	23	20	25.8%
FORB	1	0	1	0	1	2	0.8%
SCCI basa	4	1	1	8	7	2	3.8%
" leaf	10	5	6	9	14	10	9.0%
BOHI	0	1	0	0	1	1	0.5%
" leaf	0	0	0	1	1	0	0.3%
BORAD	0	5	0	6	2	4	2.8%
" leaf	4	1	5	8	3	8	4.8%
LYPH	0	0	0	0	0	0	0.0%
" leaf	1	0	0	0	0	0	0.2%
BOCU	0	0	0	4	0	2	1.0%
" leaf	1	1	2	0	2	1	1.2%
MUEM	0	1	1	0	0	0	0.3%
" leaf	0	0	0	0	0	1	0.2%
BOGR	2	0	0	0	0	0	0.3%
" leaf	3	0	0	0	0	0	0.5%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	1	0	0	0	0.2%
ARIST	0	0	1	0	0	0	0.2%
" leaf	2	0	0	0	1	0	0.5%
NOMI	0	1	6	6	8	4	4.2%
QUERCUS	0	5	15	0	10	0	5.0%
JUDE	0	0	0	0	0	13	2.2%
ERWR	1	1	0	0	0	0	0.3%
Pinyon	2	0	0	0	0	3	0.8%
Manzanita	1	0	8	10	0	0	3.2%
Grass	1	0	1	0	0	0	0.3%
Agave	0	1	0	0	0	0	0.2%
Pinyon ric	0	0	1	0	0	0	0.2%

							Mean	SD
Bare Ground	23	18	19	11	17	12	16.67	4.50
Rock	23	15	15	20	15	23	18.50	3.99
BG + Rock	46	33	34	31	32	35	35.17	5.49
Litter	24	44	24	20	23	20	25.83	9.09
Per. Gr. Bas.	6	8	3	18	10	9	9.00	5.06
Per. Gr. Leaf	21	7	14	18	21	20	16.83	5.49
Per. Gr. Total	27	15	17	36	31	29	25.83	8.21
Tree & shrub	3	7	29	16	18	20	15.50	9.35

Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil							0.0%
Rock							0.0%
LITTER							0.0%
FORB							0.0%
SCCI basal							0.0%
" leaf							0.0%
BOHI							0.0%
" leaf							0.0%
BORAD							0.0%
" leaf							0.0%
LYPH							0.0%
" leaf							0.0%
BOCU							0.0%
" leaf							0.0%
MUEM							0.0%
" leaf							0.0%
BOGR							0.0%
" leaf							0.0%
ERIN							0.0%
" leaf							0.0%
ARIST							0.0%
" leaf							0.0%
NOMI							0.0%
QUERCUS							0.0%
JUDE							0.0%
							0.0%
							0.0%
							0.0%
							0.0%
							0.0%
-							0.0%
							0.0%
							0.0%
							0.0%

							Mean	SD
Bare Ground	0	0	0	0	0	0	0.00	0.00
Rock	0	0	0	0	0	0	0.00	0.00
BG + Rock	0	0	0	0	0	0	0.00	0.00
Litter	0	0	0	0	0	0	0.00	0.00
Per. Gr. Bas.	0	0	0	0	0	0	0.00	0.00
Per. Gr. Leaf	0	0	0	0	0	0	0.00	0.00

Per. Gr. Tota	0	0	0	0	0	0	0.00	0.00
Tree & shrub	0	0	0	0	0	0	0.00	0.00

EB North
########

Cover	119 0m	120 20m	121 40m	122 60m	123 80m	124 100m	Total Cover
Soil	24	30	25	19	23	25	24.3%
Rock	11	24	8	16	8	19	14.3%
LITTER	23	15	16	20	12	19	17.5%
FORB	3	0	2	1	1	1	1.3%
SCCI base	3	0	1	3	4	0	1.8%
" leaf	14	3	11	2	11	5	7.7%
BOHI	0	0	0	0	0	1	0.2%
" leaf	0	1	3	1	3	2	1.7%
BORAD	3	8	1	3	2	7	4.0%
" leaf	6	3	2	1	2	3	2.8%
LYPH	1	0	0	0	0	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
BOCU	1	2	3	3	0	1	1.7%
" leaf	6	6	11	2	2	6	5.5%
MUEM	0	0	1	0	2	0	0.5%
" leaf	0	0	1	0	2	1	0.7%
BOGR	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ARIST	1	2	2	2	4	2	2.2%
" leaf	2	2	4	1	5	2	2.7%
NOMI	5	6	8	7	12	1	6.5%
QUERCUS	2	0	6	15	18	4	7.5%
JUDE	0	0	2	12	0	0	2.3%
ERWR	0	0	0	0	1	0	0.2%
MIDY	0	0	0	0	1	2	0.5%
Manzanita	0	0	0	0	3	0	0.5%
BOBA	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	1	0.2%

							Mean	SD
Bare Ground	24	30	25	19	23	25	24.33	3.56
Rock	11	24	8	16	8	19	14.33	6.47
BG + Rock	35	54	33	35	31	44	38.67	8.73
Litter	23	15	16	20	12	19	17.50	3.94
Per. Gr. Bas.	9	12	8	11	12	11	10.50	1.64
Per. Gr. Leaf	28	15	32	7	25	20	21.17	9.15
Per. Gr. Total	37	27	40	18	37	31	31.67	8.19
Tree & shrub	7	6	16	34	34	7	17.33	13.41

EB South
########
EB South

Cover	113 0m	114 20m	115 40m	116 60m	117 80m	118 100m	Total Cover
Soil	31	25	21	16	13	10	19.3%
Rock	14	13	23	17	15	8	15.0%
LITTER	27	22	10	15	29	21	20.7%
FORB	0	1	0	2	0	1	0.7%
SCCI basa	3	2	3	4	3	10	4.2%
" leaf	6	17	6	10	4	13	9.3%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	0	1	0	0	0	0.2%
BORAD	4	0	1	0	0	0	0.8%
" leaf	7	2	0	3	0	1	2.2%
LYPH	0	0	0	0	1	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
BOCU	1	5	3	3	4	1	2.8%
" leaf	3	4	2	2	10	10	5.2%
MUEM	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	1	0.2%
BOGR	0	1	0	0	0	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
NOMI	0	7	7	13	0	1	4.7%
QUERCUS	0	0	10	5	8	11	5.7%
Grass	2	1	0	0	2	0	0.8%
JUDE	2	2	17	24	15	15	12.5%
ARIST	0	0	0	0	0	0	0.0%
" leaf	0	1	1	0	0	0	0.3%
PIFI	0	0	2	0	0	0	0.3%
ERWR	0	0	0	1	0	1	0.3%
DICA	0	0	0	1	0	0	0.2%
YUSC	0	0	0	0	0	1	0.2%
BRICK	0	0	0	0	0	1	0.2%

							Mean	SD
Bare Ground	31	25	21	16	13	10	19.33	7.87
Rock	14	13	23	17	15	8	15.00	4.94
BG + Rock	45	38	44	33	28	18	34.33	10.29
Litter	27	22	10	15	29	21	20.67	7.17
Per. Gr. Bas.	8	8	7	7	8	11	8.17	1.47
Per. Gr. Leaf	16	24	12	16	14	25	17.83	5.38
Per. Gr. Total	24	32	19	23	22	36	26.00	6.54
Tree & shrub	2	9	34	42	23	28	23.00	15.13

F EAST
########

	55	56	57	58	59	60	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	25	13	11	26	27	31	22.2%
Rock	10	9	8	12	9	15	10.5%
LITTER	25	43	35	34	22	31	31.7%
FORB	1	0	0	0	0	1	0.3%
SCCI basa	0	0	1	0	0	0	0.2%
" leaf	2	1	7	0	1	0	1.8%
BOHI	1	0	2	0	0	0	0.5%
" leaf	1	0	0	0	0	0	0.2%
LYPH	1	0	0	0	0	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
BOCU	3	3	1	1	1	0	1.5%
" leaf	8	5	5	7	5	1	5.2%
MUEM	0	0	0	0	1	1	0.3%
" leaf	1	2	0	1	1	1	1.0%
BORAD	0	4	3	6	4	5	3.7%
" leaf	5	4	10	3	6	4	5.3%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ARIST	1	0	0	1	0	0	0.3%
" leaf	2	0	0	1	2	2	1.2%
NOMI	3	2	1	1	9	5	3.5%
QUERCUS	13	11	24	7	16	0	11.8%
JUDE	0	0	0	1	0	0	0.2%
BOGR	0	1	0	1	0	0	0.3%
" LEAF	0	3	1	2	1	0	1.2%
ERWR	2	0	0	1	2	1	1.0%
AGAVE	3	0	0	0	0	0	0.5%
KOPY	0	0	0	0	0	0	0.0%
" LEAF	0	1	0	0	0	0	0.2%
YUSC	0	0	0	0	1	0	0.2%
DICA	0	0	0	0	0	0	0.0%
" LEAF	0	0	0	0	0	1	0.2%
							0.0%

							Mean	SD
Bare Ground	25	13	11	26	27	31	22.17	8.16
Rock	10	9	8	12	9	15	10.50	2.59
BG + Rock	35	22	19	38	36	46	32.67	10.23
Litter	25	43	35	34	22	31	31.67	7.53
Per. Gr. Bas.	6	8	7	9	6	6	7.00	1.26
Per. Gr. Leaf	19	16	23	14	16	9	16.17	4.71

Per. Gr. Total	25	24	30	23	22	15	23.17	4.88
Tree & shrub	19	13	25	9	26	5	16.17	8.59

F West
########

Cover	49 0m	50 20m	51 40m	52 60m	53 80m	54 100m	Total Cover
Soil	33	15	15	16	27	29	22.5%
Rock	8	6	1	20	7	17	9.8%
LITTER	35	34	10	29	21	32	26.8%
FORB	0	0	4	1	1	0	1.0%
SCCI basa	5	2	0	2	2	1	2.0%
" leaf	1	3	9	8	6	2	4.8%
BOHI	1	0	0	0	0	0	0.2%
" leaf	1	0	4	1	2	1	1.5%
LYPH	0	1	1	0	0	0	0.3%
" leaf	0	0	0	0	1	0	0.2%
BOCU	1	2	0	0	0	1	0.7%
" leaf	0	3	4	0	1	0	1.3%
MUEM	0	0	0	1	2	1	0.7%
" leaf	0	1	3	1	2	1	1.3%
BORAD	5	4	0	2	2	4	2.8%
" leaf	4	0	2	1	6	1	2.3%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	1	0	0	0	0.2%
ARIST	1	0	2	0	0	1	0.7%
" leaf	0	0	6	0	6	0	2.0%
NOMI	1	6	17	9	5	6	7.3%
QUERCUS	6	26	34	11	5	0	13.7%
JUDE	0	0	0	0	0	0	0.0%
ERWR	0	2	4	2	5	3	2.7%
YUSC	0	0	3	0	0	0	0.5%
FAPA	0	0	1	0	0	0	0.2%
BRICK	0	0	2	0	0	0	0.3%
BOGR	0	0	0	0	0	0	0.0%
" LEAF	0	0	0	0	1	0	0.2%

							Mean	SD
Bare Ground	33	15	15	16	27	29	22.50	8.09
Rock	8	6	1	20	7	17	9.83	7.19
BG + Rock	41	21	16	36	34	46	32.33	11.60
Litter	35	34	10	29	21	32	26.83	9.66
Per. Gr. Bas.	13	9	3	5	6	8	7.33	3.50
Per. Gr. Leaf	6	7	29	11	25	5	13.83	10.48
Per. Gr. Total	19	16	32	16	31	13	21.17	8.23
Tree & shrub	7	32	55	20	10	6	21.67	19.06

G East
########

Cover	61 0m	62 20m	63 40m	64 60m	65 80m	66 100m	Total Cover
Soil	26	23	25	25	16	24	23.2%
Rock	7	5	8	2	16	29	11.2%
LITTER	33	22	32	23	24	24	26.3%
FORB	0	1	0	2	0	0	0.5%
SCCI basa	0	0	1	2	1	1	0.8%
" leaf	4	4	3	7	4	1	3.8%
BOHI	1	0	1	0	0	0	0.3%
" leaf	1	2	0	1	0	0	0.7%
BOCU	0	0	2	0	0	0	0.3%
" leaf	2	10	3	7	2	2	4.3%
NOMI	1	9	6	5	1	7	4.8%
BORAD	4	6	4	5	6	4	4.8%
" leaf	3	8	5	7	5	5	5.5%
LYPH	1	0	0	0	0	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
BOGR	3	1	0	0	2	0	1.0%
" leaf	2	4	0	1	0	0	1.2%
ERWR	1	4	0	3	1	1	1.7%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	1	0	0	0.2%
MUEM	0	0	0	1	1	1	0.5%
" leaf	0	1	0	3	1	0	0.8%
Quercus	15	0	8	14	21	0	9.7%
JUDE	0	0	0	0	0	0	0.0%
ARIST	1	2	1	1	0	1	1.0%
" leaf	0	3	3	2	1	1	1.7%
GRASS	0	0	0	1	0	0	0.2%
KOCR	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	1	0	0.2%

							Mean	SD
Bare Ground	26	23	25	25	16	24	23.17	3.66
Rock	7	5	8	2	16	29	11.17	9.91
BG + Rock	33	28	33	27	32	53	34.33	9.50
Litter	33	22	32	23	24	24	26.33	4.84
Per. Gr. Bas.	10	9	9	9	10	7	9.00	1.10
Per. Gr. Leaf	12	32	14	29	14	9	18.33	9.65
Per. Gr. Total	22	41	23	38	24	16	27.33	9.87
Tree & shrub	16	9	14	19	22	7	14.50	5.75

G East
########

	67	68	69	70	71	72	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	23	25	26	34	14	25	24.5%
Rock	8	11	21	19	17	23	16.5%
LITTER	34	15	21	19	15	27	21.8%
FORB	0	2	0	0	1	1	0.7%
SCCI basa	0	1	1	0	0	1	0.5%
" leaf	3	7	0	3	0	3	2.7%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BOCU	1	0	2	4	3	0	1.7%
" leaf	5	0	2	7	12	2	4.7%
NOMI	3	0	4	0	0	0	1.2%
BORAD	4	3	14	6	5	2	5.7%
" leaf	10	8	6	8	10	17	9.8%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	1	0	0	0	0.2%
BOGR	0	0	0	0	0	0	0.0%
" leaf	1	0	0	0	0	0	0.2%
ERWR	3	2	0	0	3	0	1.3%
ERIN	0	0	0	0	1	0	0.2%
" leaf	0	0	0	0	0	1	0.2%
MUEM	0	1	0	0	0	0	0.2%
" leaf	0	1	1	0	1	0	0.5%
Quercus	12	30	0	0	23	0	10.8%
JUDE	0	0	0	0	0	0	0.0%
ARIST	0	1	0	0	0	0	0.2%
" leaf	2	3	0	0	0	0	0.8%
KOPY	0	1	0	0	0	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
GRASS	0	0	0	1	0	0	0.2%
PEFI	0	0	0	0	1	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
OPSPI	0	0	0	0	1	0	0.2%

							Mean	SD
Bare Ground	23	25	26	34	14	25	24.50	6.41
Rock	8	11	21	19	17	23	16.50	5.86
BG + Rock	31	36	47	53	31	48	41.00	9.53
Litter	34	15	21	19	15	27	21.83	7.44
Per. Gr. Bas.	5	7	17	10	10	3	8.67	4.93
Per. Gr. Leaf	21	19	10	18	23	23	19.00	4.86
Per. Gr. Total	26	26	27	28	33	26	27.67	2.73

G East
########

	67	68	69	70	71	72	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	23	25	26	34	14	25	24.5%
Rock	8	11	21	19	17	23	16.5%
LITTER	34	15	21	19	15	27	21.8%
FORB	0	2	0	0	1	1	0.7%
SCCI basa	0	1	1	0	0	1	0.5%
" leaf	3	7	0	3	0	3	2.7%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BOCU	1	0	2	4	3	0	1.7%
" leaf	5	0	2	7	12	2	4.7%
NOMI	3	0	4	0	0	0	1.2%
BORAD	4	3	14	6	5	2	5.7%
" leaf	10	8	6	8	10	17	9.8%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	1	0	0	0	0.2%
BOGR	0	0	0	0	0	0	0.0%
" leaf	1	0	0	0	0	0	0.2%
ERWR	3	2	0	0	3	0	1.3%
ERIN	0	0	0	0	1	0	0.2%
" leaf	0	0	0	0	0	1	0.2%
MUEM	0	1	0	0	0	0	0.2%
" leaf	0	1	1	0	1	0	0.5%
Quercus	12	30	0	0	23	0	10.8%
JUDE	0	0	0	0	0	0	0.0%
ARIST	0	1	0	0	0	0	0.2%
" leaf	2	3	0	0	0	0	0.8%
KOPY	0	1	0	0	0	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
GRASS	0	0	0	1	0	0	0.2%
PEFI	0	0	0	0	1	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
OPSPI	0	0	0	0	1	0	0.2%

							Mean	SD
Bare Ground	23	25	26	34	14	25	24.50	6.41
Rock	8	11	21	19	17	23	16.50	5.86
BG + Rock	31	36	47	53	31	48	41.00	9.53
Litter	34	15	21	19	15	27	21.83	7.44
Per. Gr. Bas.	5	7	17	10	10	3	8.67	4.93
Per. Gr. Leaf	21	19	10	18	23	23	19.00	4.86
Per. Gr. Total	26	26	27	28	33	26	27.67	2.73

H East
########

Cover	25 0m	26 20m	27 40m	28 60m	29 80m	30 100m	Total Cover
Soil	12	31	23	17	16	16	19.2%
Rock	28	17	15	13	23	20	19.3%
LITTER	28	13	11	15	16	25	18.0%
FORB	3	4	6	6	1	0	3.3%
SCCI basa	1	3	1	0	0	0	0.8%
" leaf	3	2	4	6	0	7	3.7%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BORAD	1	0	1	0	0	2	0.7%
" leaf	1	9	1	2	1	1	2.5%
LYPH	1	0	0	0	0	1	0.3%
" leaf	0	0	0	0	0	0	0.0%
BOCU	0	0	0	0	1	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
MUEM	0	0	0	0	0	0	0.0%
" leaf	0	0	0	1	0	0	0.2%
BOGR	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ARIST	0	2	0	2	1	3	1.3%
" leaf	2	11	5	12	1	4	5.8%
BOBA	0	0	0	0	0	0	0.0%
" LEAF	0	0	0	0	0	0	0.0%
NOMI	6	3	7	12	4	1	5.5%
QUERCUS	3	4	15	18	0	16	9.3%
PINYON	1	0	0	0	0	0	0.2%
GRASS	6	7	16	5	21	5	10.0%
GAWR	6	0	0	0	4	4	2.3%
MANZANI	2	0	0	0	3	2	1.2%
PIFI	0	0	0	0	0	0	0.0%
" LEAF	0	0	1	0	0	0	0.2%

							Mean	SD
Bare Ground	12	31	23	17	16	16	19.17	6.79
Rock	28	17	15	13	23	20	19.33	5.54
BG + Rock	40	48	38	30	39	36	38.50	5.86
Litter	28	13	11	15	16	25	18.00	6.87
Per. Gr. Bas.	3	5	2	2	2	6	3.33	1.75
Per. Gr. Leaf	6	22	11	21	2	12	12.33	7.97
Per. Gr. Total	9	27	13	23	4	18	15.67	8.66

H West
########

Cover	31 0m	32 20m	33 40m	34 60m	35 80m	36 100m	Total Cover
Soil	17	20	16	9	13	14	14.8%
Rock	23	27	12	17	17	17	18.8%
LITTER	15	6	19	16	12	12	13.3%
FORB	8	0	3	2	4	0	2.8%
SCCI basa	0	1	0	2	0	4	1.2%
" leaf	2	3	5	8	6	11	5.8%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BORAD	0	1	1	0	0	0	0.3%
" leaf	5	4	3	1	1	0	2.3%
LYPH	0	0	0	1	0	0	0.2%
" leaf	0	0	1	0	0	1	0.3%
BOCU	0	0	0	0	0	0	0.0%
" leaf	0	0	0	2	0	0	0.3%
MUEM	0	1	0	0	0	1	0.3%
" leaf	2	1	0	0	1	2	1.0%
BOGR	0	0	1	1	0	3	0.8%
" leaf	0	0	0	1	4	2	1.2%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ARIST	0	0	1	1	3	1	1.0%
" leaf	3	4	1	9	14	13	7.3%
BOBA	0	0	0	0	0	1	0.2%
" LEAF	0	0	0	0	0	0	0.0%
NOMI	7	4	7	4	12	8	7.0%
QUERCUS	3	16	12	8	8	9	9.3%
JUDE	8	0	3	6	7	7	5.2%
GRASS	11	6	16	10	12	2	9.5%
PINYON	2	20	0	5	0	0	4.5%
YUSC	0	0	5	0	0	0	0.8%
MANZANI	0	0	0	4	6	0	1.7%
GAWR	0	0	0	0	1	5	1.0%
RHTR	0	0	0	0	0	1	0.2%

							Mean	SD
Bare Ground	17	20	16	9	13	14	14.83	3.76
Rock	23	27	12	17	17	17	18.83	5.31
BG + Rock	40	47	28	26	30	31	33.67	8.12
Litter	15	6	19	16	12	12	13.33	4.46
Per. Gr. Bas.	0	3	3	5	3	10	4.00	3.35
Per. Gr. Leaf	12	12	10	21	26	29	18.33	8.12

Per. Gr. Total	12	15	13	26	29	39	22.33	10.80
Tree & shrub	18	20	27	22	34	30	25.17	6.21

I 137
########

Cover	137 0m	138 20m	139 40m	140 60m	141 80m	142 100m	Total Cover
Soil	12	16	11	16	24	20	16.5%
Rock	7	14	14	7	10	28	13.3%
LITTER	21	11	18	20	16	22	18.0%
FORB	4	1	3	4	3	1	2.7%
SCCI basa	1	6	2	4	3	2	3.0%
" leaf	5	24	12	21	17	12	15.2%
BOHI	0	0	0	0	0	0	0.0%
" leaf	1	0	0	0	0	0	0.2%
BORAD	4	4	2	0	0	3	2.2%
" leaf	5	3	2	3	1	3	2.8%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BOCU	3	0	2	2	0	0	1.2%
" leaf	10	0	4	3	0	0	2.8%
MUEM	0	1	0	1	2	0	0.7%
" leaf	0	2	7	3	0	2	2.3%
BOGR	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ERIN	0	0	0	0	0	0	0.0%
" leaf	1	0	2	0	0	0	0.5%
ARIST	0	0	0	0	0	0	0.0%
" leaf	0	0	3	1	4	1	1.5%
NOMI	9	11	6	11	3	7	7.8%
QUERCUS	6	11	22	12	10	0	10.2%
JUDE	15	8	0	0	0	0	3.8%
MANZ	0	0	2	3	13	0	3.0%
YUBA	0	0	0	1	0	0	0.2%
PINYON	0	0	0	0	0	0	0.0%
MIDY	0	0	1	0	0	0	0.2%
GRASS	1	0	0	0	0	0	0.2%
PIFI	0	0	0	0	0	0	0.0%
" LEAF	5	0	1	0	0	0	1.0%
							0.0%

							Mean	SD
Bare Ground	12	16	11	16	24	20	16.50	4.89
Rock	7	14	14	7	10	28	13.33	7.84
BG + Rock	19	30	25	23	34	48	29.83	10.34
Litter	21	11	18	20	16	22	18.00	4.05
Per. Gr. Bas.	13	11	7	7	5	5	8.00	3.29
Per. Gr. Leaf	27	29	31	31	22	18	26.33	5.28

Per. Gr. Total	40	40	38	38	27	23	34.33	7.39
Tree & shrub	30	30	31	27	26	7	25.17	9.11

I 143-148
########

Cover	143 0m	144 20m	145 40m	146 60m	147 80m	148 100m	Total Cover
Soil	7	13	15	16	19	15	14.2%
Rock	27	4	3	22	6	29	15.2%
LITTER	19	22	21	19	13	22	19.3%
FORB	2	4	1	0	1	3	1.8%
SCCI basa	5	2	8	1	2	1	3.2%
" leaf	13	15	13	6	5	9	10.2%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	1	1	0	3	1	1.0%
BORAD	3	1	2	4	4	0	2.3%
" leaf	7	1	4	6	4	7	4.8%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BOCU	0	1	4	0	0	0	0.8%
" leaf	0	5	12	2	0	1	3.3%
MUEM	0	0	2	1	1	0	0.7%
" leaf	1	2	1	0	7	0	1.8%
BOGR	1	0	0	0	0	1	0.3%
" leaf	2	0	0	0	0	0	0.3%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	2	0	0	0.3%
ARIST	2	0	0	0	2	5	1.5%
" leaf	7	3	5	5	9	3	5.3%
NOMI	5	9	10	4	22	0	8.3%
QUERCUS	0	8	9	3	0	0	3.3%
JUDE	0	11	7	0	15	0	5.5%
MANZ	0	9	0	11	0	2	3.7%
YUSC	1	1	0	3	0	0	0.8%
Pinyon	0	0	3	0	0	0	0.5%
MIDY	0	0	0	0	3	2	0.8%
Grass	0	0	0	5	6	0	1.8%
PIFI	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
							0.0%

							Mean	SD
Bare Ground	7	13	15	16	19	15	14.17	4.02
Rock	27	4	3	22	6	29	15.17	12.12
BG + Rock	34	17	18	38	25	44	29.33	11.06
Litter	19	22	21	19	13	22	19.33	3.39
Per. Gr. Bas.	11	4	16	6	9	7	8.83	4.26
Per. Gr. Leaf	30	27	36	21	28	21	27.17	5.71

Per. Gr. Total	41	31	52	27	37	28	36.00	9.51
Tree & shrub	6	38	29	21	40	4	23.00	15.52

J North
########

Cover	85 0m	86 20m	87 40m	88 60m	89 80m	90 100m	Total Cover
Soil	22	21	17	20	28	12	20.0%
Rock	20	8	6	14	8	8	10.7%
LITTER	29	25	20	18	21	16	21.5%
FORB	0	0	0	1	2	1	0.7%
SCCI basa	4	7	4	5	5	9	5.7%
" leaf	6	5	10	13	8	24	11.0%
BOHI	0	0	0	1	0	0	0.2%
" leaf	0	0	1	2	0	0	0.5%
BORAD	3	2	1	2	0	0	1.3%
" leaf	5	2	5	1	1	2	2.7%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BOCU	2	1	0	1	2	1	1.2%
" leaf	1	5	2	4	5	4	3.5%
MUEM	0	1	0	0	0	0	0.2%
" leaf	0	4	1	0	1	0	1.0%
BOGR	0	0	0	0	1	0	0.2%
" leaf	0	0	2	0	3	0	0.8%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	5	1	0	1.0%
ARIST	0	0	1	0	0	0	0.2%
" leaf	0	2	1	0	2	2	1.2%
BOBA	0	0	0	0	0	0	0.0%
" LEAF	0	0	0	0	0	0	0.0%
ERWR	0	1	0	0	0	0	0.2%
NOMI	10	19	10	1	14	11	10.8%
QUERCUS	0	0	25	19	3	20	11.2%
GRASS	0	0	1	0	0	0	0.2%
MIDY	0	0	2	0	0	0	0.3%
JUDE	0	0	6	11	0	0	2.8%
							0.0%
							0.0%
							0.0%

							Mean	SD
Bare Ground	22	21	17	20	28	12	20.00	5.33
Rock	20	8	6	14	8	8	10.67	5.32
BG + Rock	42	29	23	34	36	20	30.67	8.29
Litter	29	25	20	18	21	16	21.50	4.76
Per. Gr. Bas.	9	11	6	9	8	10	8.83	1.72
Per. Gr. Leaf	12	18	22	25	21	32	21.67	6.71

Per. Gr. Total	21	29	28	34	29	42	30.50	7.01
Tree & shrub	10	19	43	31	17	31	25.17	12.01

J South
########

Cover	85 0m	86 20m	87 40m	88 60m	89 80m	90 100m	Total Cover
Soil	22	21	17	20	28	12	20.0%
Rock	20	8	6	14	8	8	10.7%
LITTER	29	25	20	18	21	16	21.5%
FORB	0	0	0	1	2	1	0.7%
SCCI basa	4	7	4	5	5	9	5.7%
" leaf	6	5	10	13	8	24	11.0%
BOHI	0	0	0	1	0	0	0.2%
" leaf	0	0	1	2	0	0	0.5%
BORAD	3	2	1	2	0	0	1.3%
" leaf	5	2	5	1	1	2	2.7%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
BOCU	2	1	0	1	2	1	1.2%
" leaf	1	5	2	4	5	4	3.5%
MUEM	0	1	0	0	0	0	0.2%
" leaf	0	4	1	0	1	0	1.0%
BOGR	0	0	0	0	1	0	0.2%
" leaf	0	0	2	0	3	0	0.8%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	5	1	0	1.0%
ARIST	0	0	1	0	0	0	0.2%
" leaf	0	2	1	0	2	2	1.2%
BOBA	0	0	0	0	0	0	0.0%
" LEAF	0	0	0	0	0	0	0.0%
ERWR	0	1	0	0	0	0	0.2%
NOMI	10	19	10	1	14	11	10.8%
QUERCUS	0	0	25	19	3	20	11.2%
GRASS	0	0	1	0	0	0	0.2%
MIDY	0	0	2	0	0	0	0.3%
JUDE	0	0	6	11	0	0	2.8%

							Mean	SD
Bare Ground	22	21	17	20	28	12	20.00	5.33
Rock	20	8	6	14	8	8	10.67	5.32
BG + Rock	42	29	23	34	36	20	30.67	8.29
Litter	29	25	20	18	21	16	21.50	4.76
Per. Gr. Bas.	9	11	6	9	8	10	8.83	1.72
Per. Gr. Leaf	12	18	22	25	21	32	21.67	6.71
Per. Gr. Total	21	29	28	34	29	42	30.50	7.01
Tree & shrub	10	19	43	31	17	31	25.17	12.01

K 79-84
########

	79	80	81	82	83	84	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	20	36	20	32	27	21	26.0%
Rock	31	14	25	19	16	9	19.0%
LITTER	30	28	29	16	21	21	24.2%
FORB	4	0	1	1	1	4	1.8%
SCCI basa	0	2	0	1	0	1	0.7%
" leaf	2	2	6	0	0	3	2.2%
BOHI	0	0	1	1	0	0	0.3%
" leaf	0	1	1	1	0	0	0.5%
BORAD	3	4	7	5	2	5	4.3%
" leaf	6	6	0	9	5	7	5.5%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	1	0.2%
BOCU	1	1	0	0	2	1	0.8%
" leaf	0	2	0	1	2	9	2.3%
MUEM	0	0	0	1	0	0	0.2%
" leaf	0	0	0	1	0	0	0.2%
BOGR	0	0	0	0	0	0	0.0%
" leaf	0	0	0	1	0	1	0.3%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	2	0.3%
ARIST	0	0	0	0	1	0	0.2%
" leaf	1	1	0	2	0	0	0.7%
NOMI	0	3	7	4	2	3	3.2%
QUERCUS	0	0	2	0	0	15	2.8%
JUDE	0	3	0	0	18	0	3.5%
ERWR	1	2	0	1	2	0	1.0%
GRASS	0	0	1	3	1	4	1.5%
MANZ	0	0	1	0	0	0	0.2%
BOBA	0	0	0	0	0	0	0.0%
" LEAF	0	0	0	2	2	0	0.7%

							Mean	SD
Bare Ground	20	36	20	32	27	21	26.00	6.84
Rock	31	14	25	19	16	9	19.00	7.92
BG + Rock	51	50	45	51	43	30	45.00	8.07
Litter	30	28	29	16	21	21	24.17	5.64
Per. Gr. Bas.	4	7	8	8	5	7	6.50	1.64
Per. Gr. Leaf	9	12	7	17	9	23	12.83	6.08
Per. Gr. Total	13	19	15	25	14	30	19.33	6.83
Tree & shrub	0	6	10	4	20	18	9.67	7.94

K SOUTH
########

Cover	73 0m	74 20m	75 40m	76 60m	77 80m	78 100m	Total Cover
Soil	27	12	24	22	28	20	22.2%
Rock	16	23	15	15	12	13	15.7%
LITTER	22	25	1	25	21	20	19.0%
FORB	1	0	6	1	0	1	1.5%
SCCI basa	2	2	5	6	4	4	3.8%
" leaf	5	10	0	5	12	15	7.8%
BOHI	0	0	0	0	0	0	0.0%
" leaf	0	0	5	0	1	0	1.0%
BORAD	2	7	7	5	2	4	4.5%
" leaf	2	4	0	7	5	3	3.5%
LYPH	0	0	0	0	0	0	0.0%
" leaf	0	0	2	0	0	0	0.3%
BOCU	0	0	0	2	0	0	0.3%
" leaf	1	0	1	0	1	0	0.5%
MUEM	0	0	0	1	0	0	0.2%
" leaf	0	2	0	0	0	0	0.3%
BOGR	0	0	0	0	0	0	0.0%
" leaf	1	0	0	0	0	0	0.2%
ERIN	1	0	0	0	0	0	0.2%
" leaf	2	1	0	0	1	1	0.8%
ARIST	0	0	0	0	0	0	0.0%
" leaf	0	1	0	0	1	0	0.3%
NOMI	2	7	8	13	6	7	7.2%
QUERCUS	21	13	0	0	0	13	7.8%
JUDE	0	0	0	0	6	10	2.7%
GRASS	1	0	0	0	0	0	0.2%
AGAVE	1	0	0	0	0	0	0.2%
OPSPI	0	1	0	0	0	0	0.2%
YUSC	0	0	2	0	2	0	0.7%

-

							Mean	SD
Bare Ground	27	12	24	22	28	20	22.17	5.81
Rock	16	23	15	15	12	13	15.67	3.88
BG + Rock	43	35	39	37	40	33	37.83	3.60
Litter	22	25	1	25	21	20	19.00	9.06
Per. Gr. Bas.	5	9	12	14	6	8	9.00	3.46
Per. Gr. Leaf	11	18	8	12	21	19	14.83	5.19
Per. Gr. Total	16	27	20	26	27	27	23.83	4.71
Tree & shrub	24	21	10	13	14	30	18.67	7.63

M-north
########

Cover	0m	107 20m	108 40m	109 60m	110 80m	111 100m	112	Total Cover
Soil		35	26	26	37	28	9	26.8%
Rock		13	13	3	5	12	7	8.8%
LITTER		20	17	23	23	22	32	22.8%
FORB		1	0	0	1	0	0	0.3%
SCCI basa		0	1	1	2	0	0	0.7%
" leaf		2	3	9	0	3	0	2.8%
BOHI		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	3	0	0.5%
BORAD		0	1	0	6	0	5	2.0%
" leaf		4	4	1	3	8	1	3.5%
LYPH		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
BOCU		0	2	2	2	0	2	1.3%
" leaf		0	4	2	1	5	8	3.3%
MUEM		0	0	0	1	0	0	0.2%
" leaf		0	1	1	0	0	0	0.3%
BOGR		0	0	0	1	1	0	0.3%
" leaf		5	0	1	1	0	2	1.5%
ERIN		0	1	0	0	0	0	0.2%
" leaf		0	0	0	1	0	1	0.3%
ARIST		2	1	1	1	1	3	1.5%
" leaf		1	3	1	2	4	3	2.3%
NOMI		12	14	14	5	8	5	9.7%
QUERCUS		11	14	25	4	0	27	13.5%
JUDE		0	0	0	0	7	3	1.7%
ERWR		0	3	2	0	1	4	1.7%
GRASS		0	1	0	1	0	0	0.3%
MIBI		0	0	0	0	0	0	0.0%
BOBA		0	0	0	0	0	0	0.0%
" leaf		0	0	0	1	0	0	0.2%
PIFI		0	0	0	0	0	1	0.2%
" leaf		0	0	0	0	0	2	0.3%
OPSPI		0	0	0	0	0	1	0.2%

							Mean	SD
Bare Ground	35	26	26	37	28	9	26.83	9.91
Rock	13	13	3	5	12	7	8.83	4.40
BG + Rock	48	39	29	42	40	16	35.67	11.43
Litter	20	17	23	23	22	32	22.83	5.04
Per. Gr. Bas.	2	6	4	13	2	11	6.33	4.68

Per. Gr. Leaf	12	15	15	9	23	17	15.17	4.75
Per. Gr. Total	14	21	19	22	25	28	21.50	4.85
Tree & shrub	23	28	39	9	15	36	25.00	11.71

M-south
########

Cover	0m	101	20m	102	40m	103	60m	104	80m	105	100m	106	Total Cover
Soil		19		22		24		19		35		10	21.5%
Rock		11		7		9		5		10		1	7.2%
LITTER		35		9		25		15		27		12	20.5%
FORB		0		4		1		1		1		1	1.3%
SCCI basa		3		2		0		3		0		0	1.3%
" leaf		0		2		1		8		3		5	3.2%
BOHI		0		1		0		0		0		0	0.2%
" leaf		0		5		1		0		0		3	1.5%
BORAD		1		3		0		2		1		0	1.2%
" leaf		1		3		1		1		2		1	1.5%
LYPH		0		0		0		0		0		1	0.2%
" leaf		0		0		0		0		0		3	0.5%
BOCU		0		3		5		5		0		2	2.5%
" leaf		1		6		6		9		3		9	5.7%
MUEM		0		0		0		0		0		1	0.2%
" leaf		0		1		0		0		1		3	0.8%
BOGR		8		2		1		1		1		3	2.7%
" leaf		1		1		0		3		0		4	1.5%
ERIN		0		0		0		0		0		0	0.0%
" leaf		0		4		0		0		0		3	1.2%
ARIST		0		0		0		0		0		1	0.2%
" leaf		1		0		0		1		0		1	0.5%
NOMI		14		22		11		14		8		17	14.3%
QUERCUS		3		14		15		0		9		56	16.2%
JUDE		0		1		1		0		0		0	0.3%
YUSC		3		0		0		0		0		1	0.7%
ERWR		0		2		2		2		5		4	2.5%
JUMO		0		0		0		13		0		0	2.2%

							Mean	SD
Bare Ground	19	22	24	19	35	10	21.50	8.17
Rock	11	7	9	5	10	1	7.17	3.71
BG + Rock	30	29	33	24	45	11	28.67	11.15
Litter	35	9	25	15	27	12	20.50	10.07
Per. Gr. Bas.	12	11	6	11	2	8	8.33	3.83
Per. Gr. Leaf	4	22	9	22	9	32	16.33	10.67
Per. Gr. Total	16	33	15	33	11	40	24.67	12.08
Tree & shrub	20	37	27	27	17	74	33.67	20.93

N EAST
########

Cover	0m	13 20m	14 40m	15 60m	16 80m	17 100m	18	Total Cover
Soil		22	19	20	26	10	7	17.3%
Rock		11	1	2	1	5	5	4.2%
LITTER		36	29	45	33	31	34	34.7%
FORB		0	3	0	0	0	0	0.5%
SCCI basa		2	1	0	0	0	0	0.5%
" leaf		1	2	1	2	0	5	1.8%
BOHI		1	3	0	0	0	0	0.7%
" leaf		2	9	0	0	0	1	2.0%
BORAD		2	0	0	1	0	0	0.5%
" leaf		2	0	0	1	0	0	0.5%
LYPH		2	2	2	0	0	1	1.2%
" leaf		0	3	2	0	1	0	1.0%
BOCU		1	0	0	0	2	0	0.5%
" leaf		3	3	1	3	6	2	3.0%
MUEM		0	1	0	0	0	0	0.2%
" leaf		1	1	0	1	0	0	0.5%
BOGR		1	3	5	2	2	1	2.3%
" leaf		0	6	10	4	9	1	5.0%
ERIN		0	0	0	0	0	0	0.0%
" leaf		0	0	0	0	0	0	0.0%
ARIST		0	1	0	2	0	1	0.7%
" leaf		1	3	4	4	2	2	2.7%
NOMI		7	9	6	3	5	14	7.3%
QUERCUS		5	6	0	22	40	24	16.2%
JUDE		0	0	0	0	0	2	0.3%
ERWR		0	0	0	1	0	0	0.2%
ELBA		0	0	0	1	0	0	0.2%
Agave		0	0	0	0	0	1	0.2%
ACAN		0	0	0	0	0	1	0.2%

							Mean	SD
Bare Ground	22	19	20	26	10	7	17.33	7.31
Rock	11	1	2	1	5	5	4.17	3.82
BG + Rock	33	20	22	27	15	12	21.50	7.71
Litter	36	29	45	33	31	34	34.67	5.61
Per. Gr. Bas.	9	11	7	5	4	3	6.50	3.08
Per. Gr. Leaf	10	27	18	16	18	11	16.67	6.12
Per. Gr. Total	19	38	25	21	22	14	23.17	8.13
Tree & shrub	12	15	6	25	45	42	24.17	16.22

N WEST
########

	19	20	21	22	23	24	
Cover	0m	20m	40m	60m	80m	100m	Total Cover
Soil	28	22	23	12	15	31	21.8%
Rock	5	5	7	5	2	3	4.5%
LITTER	36	21	41	54	43	30	37.5%
FORB	2	0	0	1	0	0	0.5%
SCCI basa	0	0	0	0	0	0	0.0%
" leaf	1	0	0	1	3	0	0.8%
BOHI	1	0	0	0	1	0	0.3%
" leaf	4	0	1	0	1	1	1.2%
BORAD	0	5	0	0	4	1	1.7%
" leaf	2	2	4	3	1	3	2.5%
LYPH	0	0	0	0	0	1	0.2%
" leaf	1	1	0	0	0	0	0.3%
BOCU	0	1	0	3	1	0	0.8%
" leaf	2	0	1	7	1	3	2.3%
MUEM	0	0	0	0	1	0	0.2%
" leaf	0	0	0	0	0	0	0.0%
BOGR	1	4	0	3	8	3	3.2%
" leaf	9	7	6	6	2	6	6.0%
ERIN	0	0	0	0	0	0	0.0%
" leaf	0	1	0	0	0	0	0.2%
ARIST	0	0	0	0	0	0	0.0%
" leaf	1	4	2	2	1	5	2.5%
NOMI	2	22	14	2	5	12	9.5%
QUERCUS	9	17	0	0	13	2	6.8%
JUDE	1	0	0	0	0	0	0.2%
ERWR	0	0	3	0	0	0	0.5%
YUSC	0	0	0	1	0	0	0.2%

							Mean	SD
Bare Ground	28	22	23	12	15	31	21.83	7.31
Rock	5	5	7	5	2	3	4.50	1.76
BG + Rock	33	27	30	17	17	34	26.33	7.63
Litter	36	21	41	54	43	30	37.50	11.36
Per. Gr. Bas.	2	10	0	6	15	5	6.33	5.47
Per. Gr. Leaf	20	15	14	19	9	18	15.83	4.07
Per. Gr. Total	22	25	14	25	24	23	22.17	4.17
Tree & shrub	12	39	14	3	18	14	16.67	12.03

Table 1

Changes in % Cover
2000 vs. 2001

Numbers in bold italics represent statistically significant differences at the $p < 0.05$ level. t-values for Table 1 are located in Appendix B.

Plot	*Bare Ground 2000*	*Bare Ground 2001*	*Litter 2000*	*Litter 2001*	*Perennial Grass 2000 **	*Perennial Grass 2001*
A	25.8	20.4	10.6	10.0	47.5	50.8
B	***40.1***	***30.9***	9.0	11.7	40.9	43.7
C	***37.8***	***32.6***	11.8	14.3	***32.2***	***41.1***
EB	***34.4***	***28.8***	***12.4***	***8.8***	43.4	47.8
F	***32.7***	***20.4***	***18.0***	***13.8***	***25.8***	***47.9***
G	***36.8***	***22.4***	***18.9***	***11.3***	***36.2***	***51.4***
H	***46.8***	***36.8***	12.9	11.1	20.7	25.8
I	***34.6***	***24.2***	***12.3***	***7.3***	***40.3***	***47.1***
J2	***36.8***	***26.3***	9.8	9.9	***41.7***	***53.8***
K	36.2	35.4	11.4	13.4	41.7	39.9
M	***28.8***	***20.3***	14.2	16.3	46.2	42.2
N	-	21.9	-	24.1	-	23.3

* perennial grass is combined basal and ~~litter~~ leaf cover.

Description of Chart Data

The charts contained in Appendix A contain details of changes that occurred from year 2000 to 2001. Below is a description of measurements that are contained in the charts.

Bare Ground

This measures all bare ground (soil) hits within the plot. It is reported as a percent cover of the entire plot. Unlike plant cover, this value should be as low as possible for the habitat type. If a value of 50% is measured one year but measures 60% the following year, this should give cause for alarm. The reason for this is that the higher percent cover of bare ground, the less the soil is protected from erosion.

Rock

This measures all hits upon solid bedrock or rocks larger than 1cm in diameter. Rocks are not prone to erosion on the human time scale and therefore an increase in rock cover is not a great cause of concern. However, a loss of vegetative cover exposes more rock, and an increase in rock cover could be due to loss of plant cover.

Bare Ground + Rock

Functional categories of variables measured were used to perform the analysis. Bare ground (soil) and rock were combined to form one category called bare ground + rock. Deciding the difference between bare ground and rock when sampling can be difficult since boundary decisions are always being made at virtually every data point. By combining bare ground and rock, the variability among field personnel can be minimized to allow for a more precise data analysis.

Litter

Litter is defined as a mulch or duff layer that lies on top of the soil. It can be a thick organic layer, animal dung, or loose leaves. As long as it covers and adequately protects the soil from wind and rain, it qualifies as litter. When sampling in the field, judgment calls must be made as to whether the point is soil or litter. Most soil contains organic matter at the surface. However, it is the size of these particles and the differentiation of them as soil or litter that cause the most confusion amongst field personnel. I use what is known as the "raindrop test" to make these decisions. If you visualize a raindrop falling and striking the soil with all its kinetic energy, then it will surely impact the soil with enough force to explode and erode soil particles. If the litter object under scrutiny is able to absorb and disperse that energy and prevent soil damage, then it probably qualifies as litter.

Perennial grass basal

Basal cover measurements are commonly used in monitoring protocols. Basal cover measures only the center crown of an individual grass plant that is rooted in the ground. The leaves that project out beyond this central clump of grass are not counted. Very little basal cover exists in arid grasslands, and making accurate measurements of basal cover are difficult. Furthermore, sample sizes large enough to accurately measure changes in basal cover are beyond the scope of a project such as this. However, basal cover is recorded because it is standard protocol in most monitoring projects.

Perennial grass leaf

This is a measure of the leaf (or aerial) cover of grasses that project out over the main basal clump of grass. An average of 3 times more leaf cover than basal cover exists at

Appendix A

Charts and Graphs

the research site; therefore, we can detect changes in leaf cover more precisely than we can basal cover. Leaf cover is important because grass leaves help to protect the soil from raindrop impact.

Perennial grass total
This is the sum total of basal and leaf cover measurements. It provides a more accurate view of how much cover actually is present on the plot. A high cover value or an increasing trend in percent cover is desired. This measurement is the combined total of basal and aerial cover for all perennial grasses within the plot.

Tree and Shrub
This includes oak, manzanita, agave or any other thick stemmed tree or shrub. The sampling design used is tailored for measuring grass cover more than it is for measuring trees and shrubs. The distribution of trees and shrubs is not as even as it is for grasses. Therefore measurements within the plot can vary widely and standard deviations tend to be high. Significance testing, such as a t-test, is probably not a wise tool for evaluating changes in tree and shrub cover. The confidence intervals located in the 2000 vs. 2001 workbook and in Appendix B describe the inherent variability of tree and shrub cover. Aerial photography would be a better tool for measuring tree and shrub cover more accurately.

Literature Cited

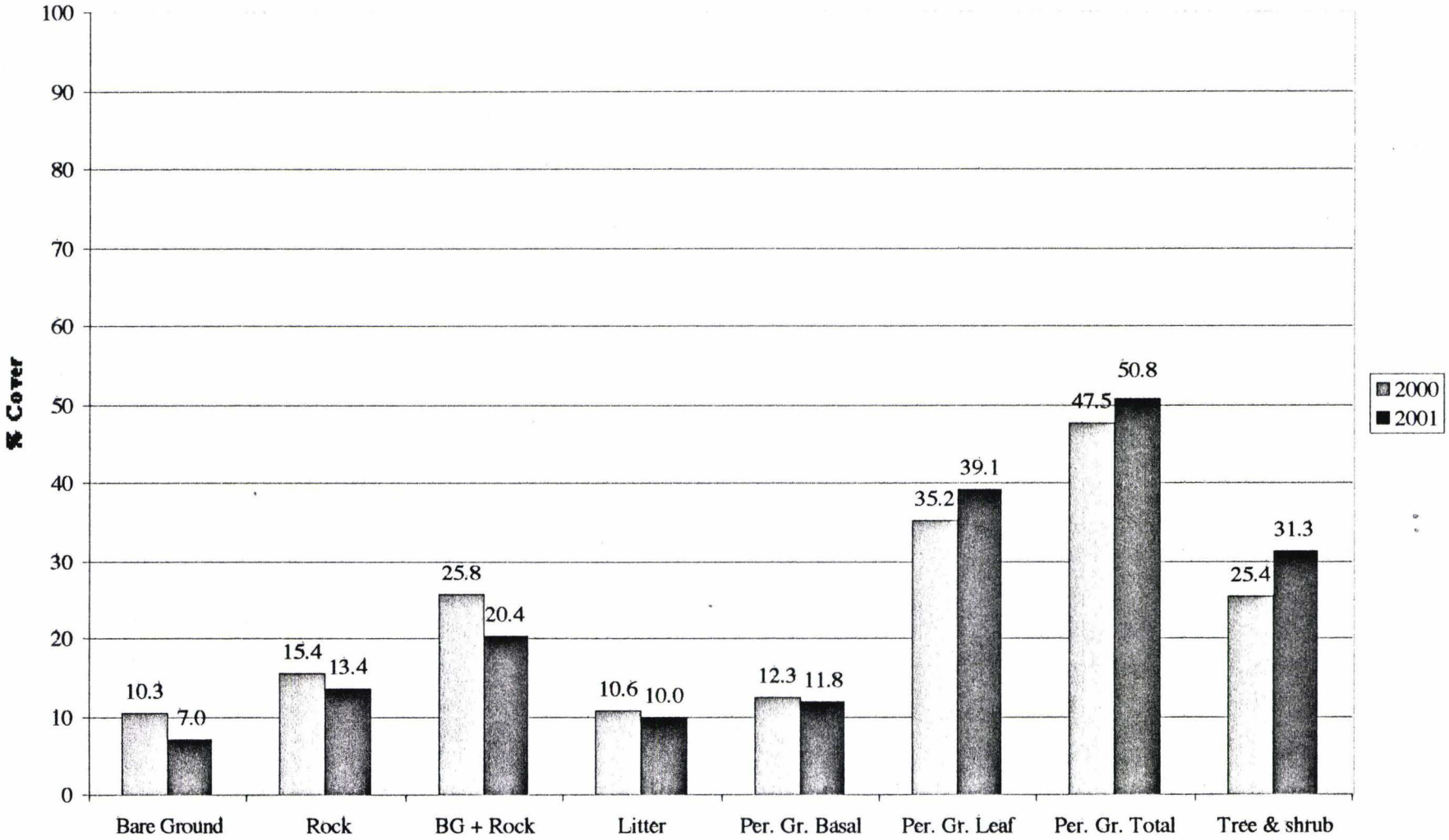
Bonham, Charles D. 1989. Measurements for Terrestrial Vegetation. John Wiley and Sons, Inc. New York.

Brown, D.E., C.H. Lowe. 1980. Biotic Communities of the Southwest. USDA Forest Service Technical Report RM-78. Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

Dretzke, B.J., Heilman, K.A. 1998. Statistics with Microsoft Excel. Prentice Hall Inc. Upper Saddle River, NJ.

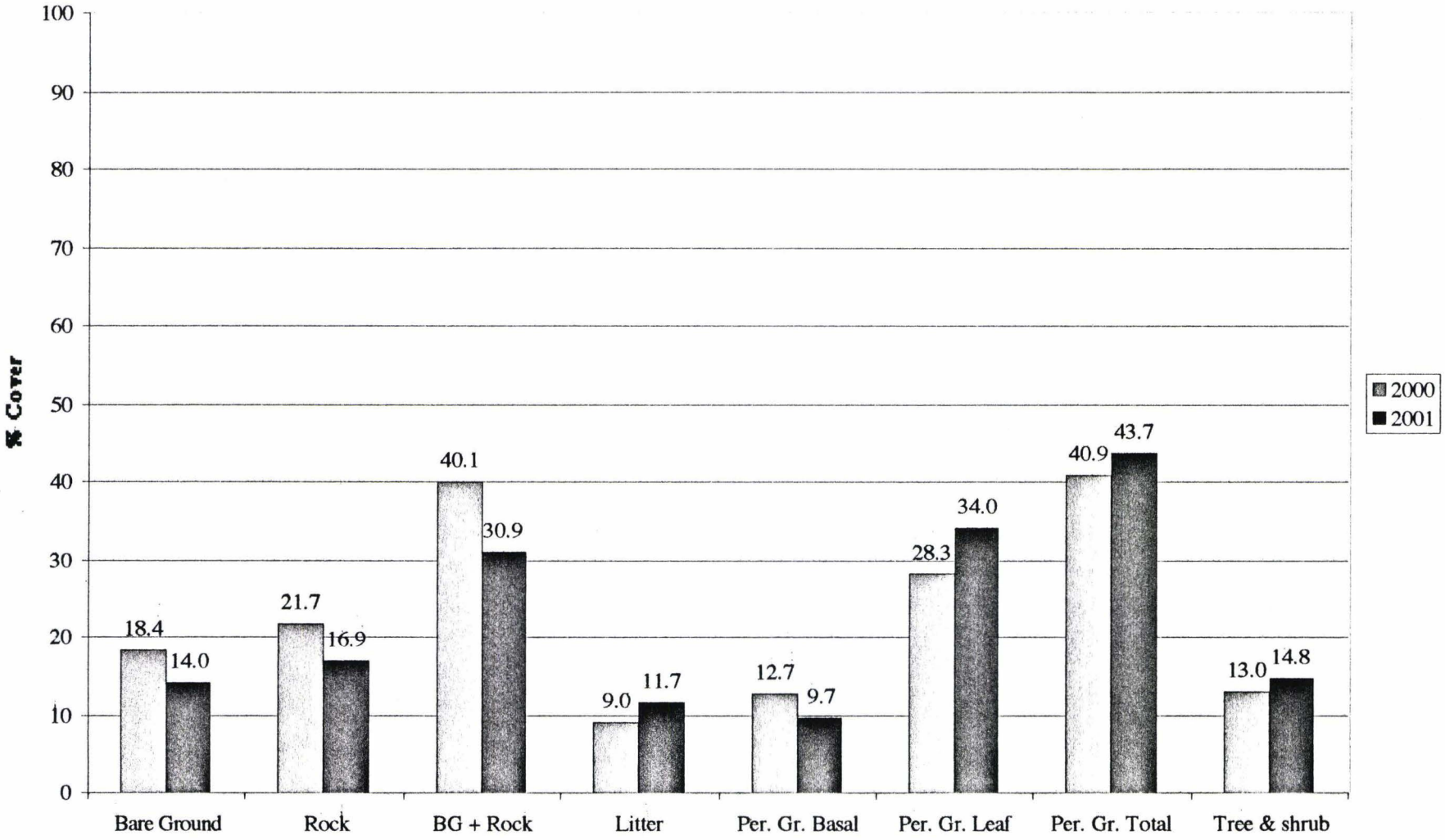
Elzinga, C.L., D.W. Salzer and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. BLM Technical Reference 1730-1.

Watershed A
2000 vs. 2001



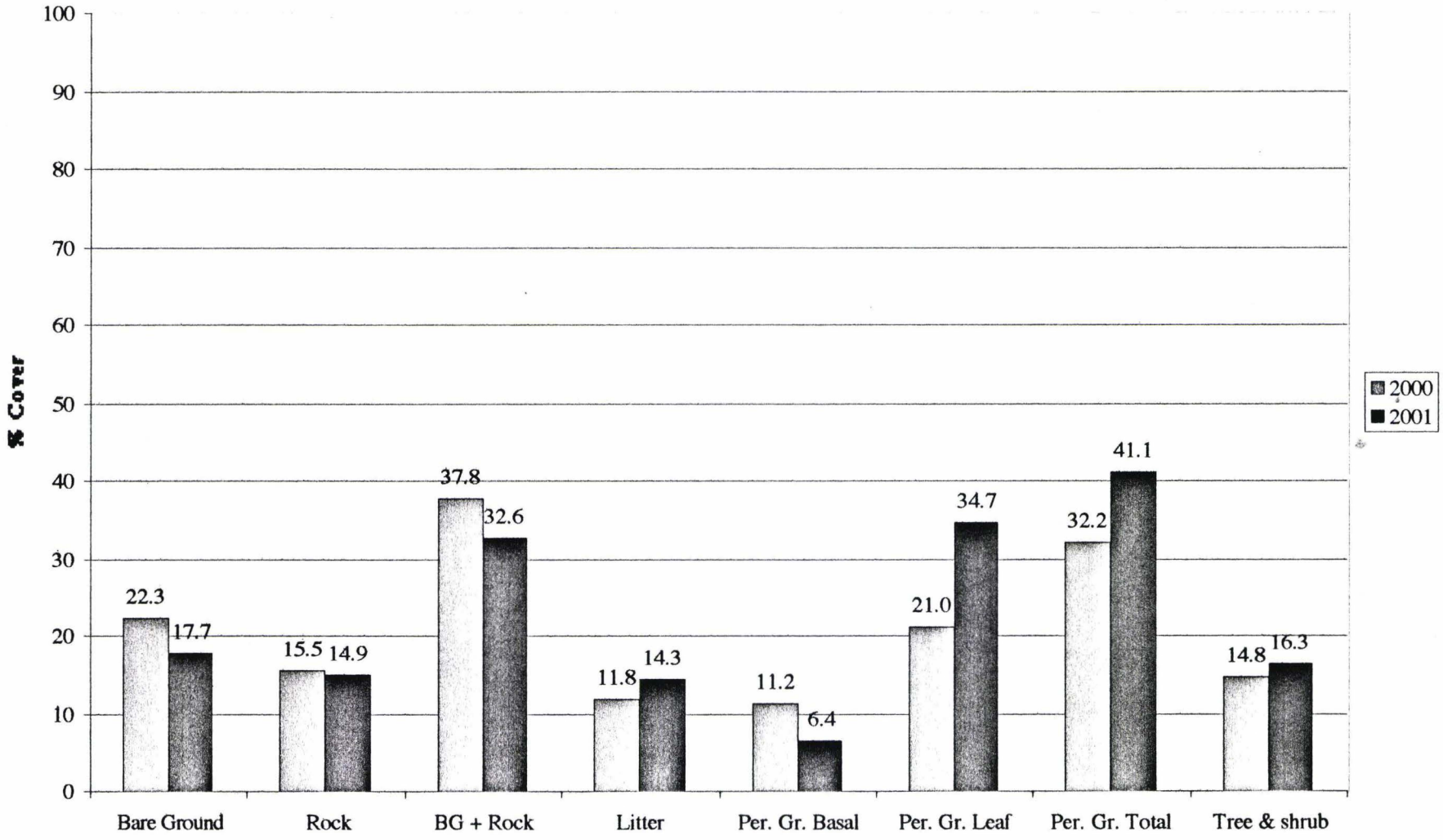
A 00v01

Watershed B
2000 vs. 2001



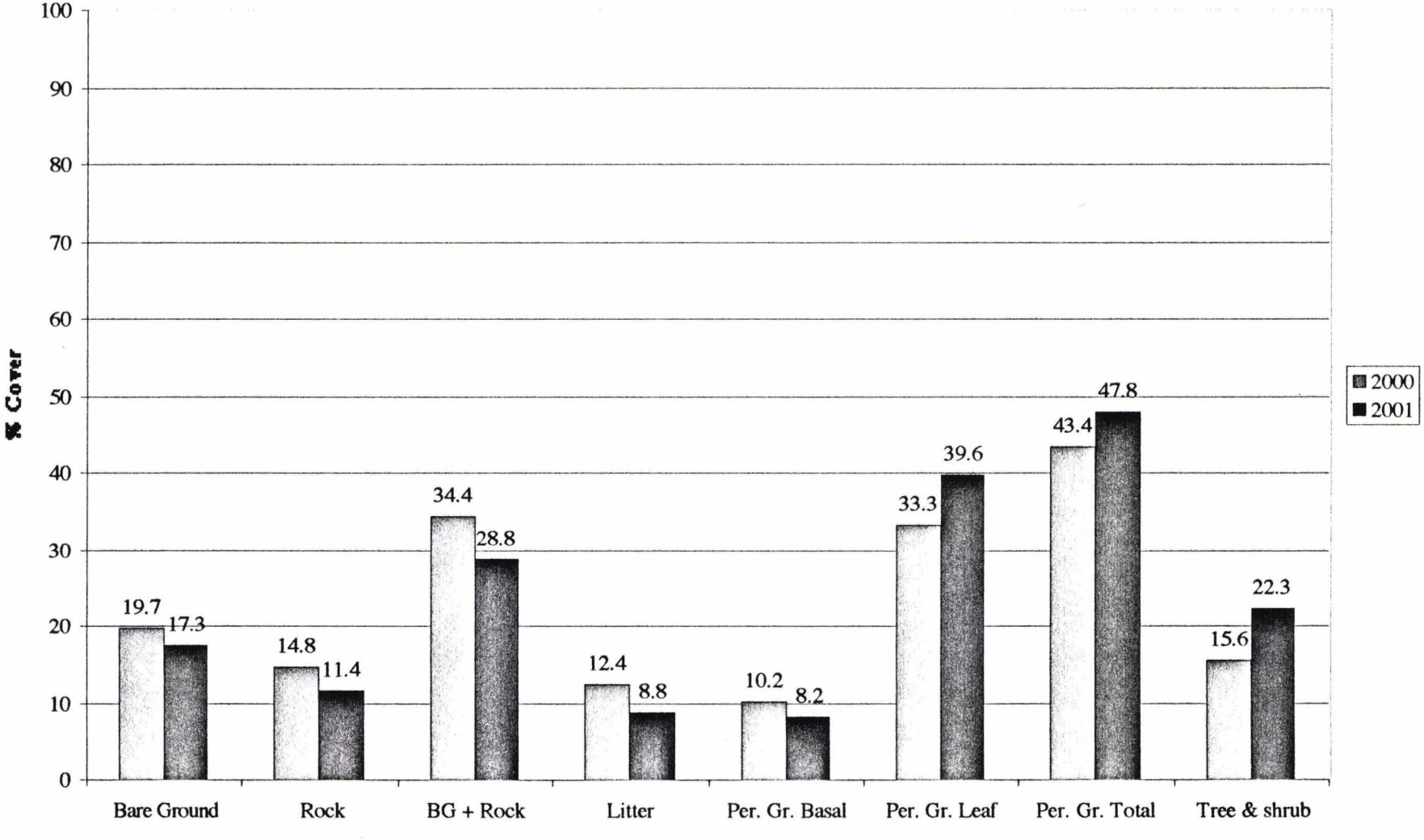
B 00v01

Watershed C
2000 vs. 2001



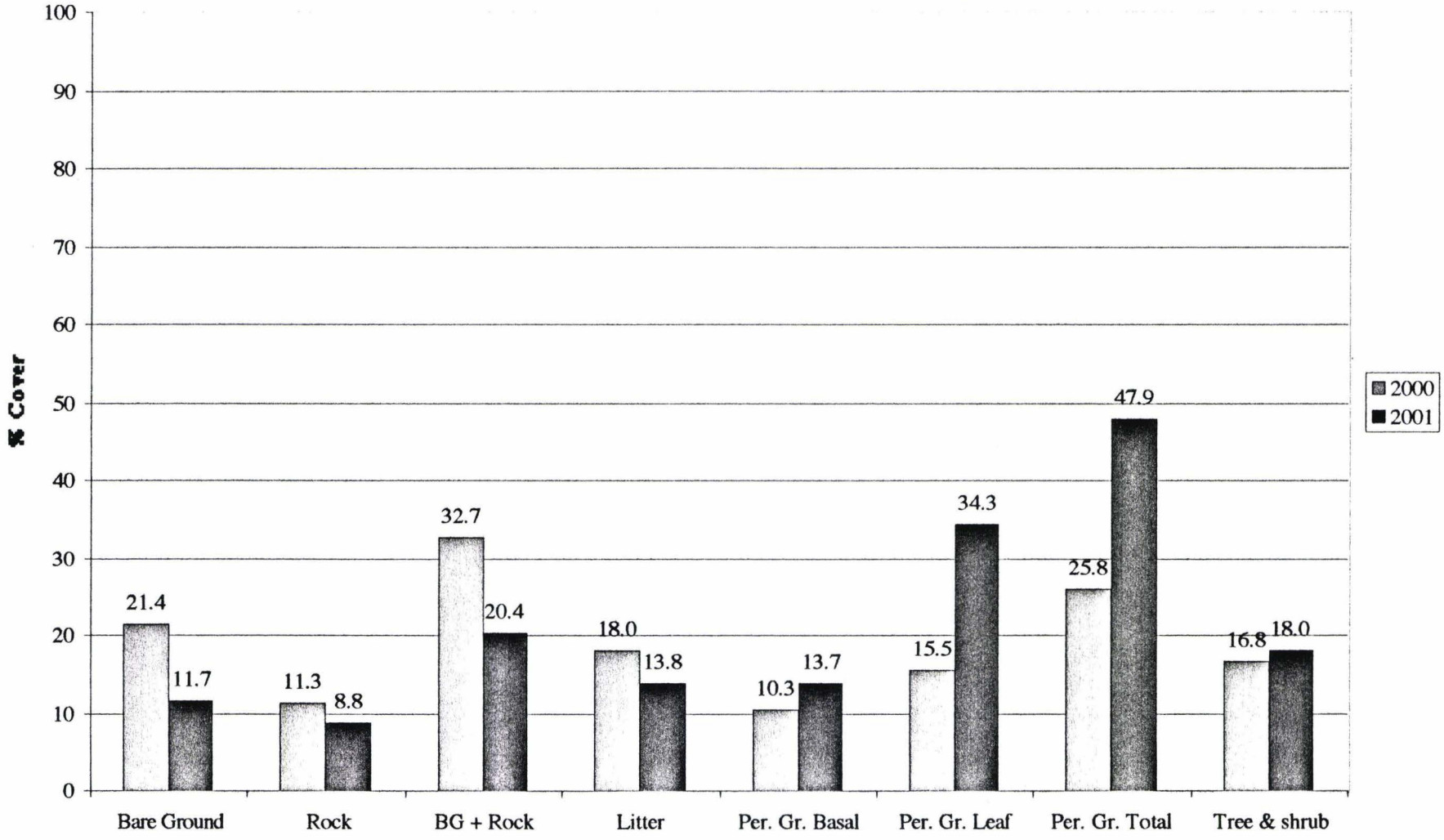
C 00v01

Watershed EB
2000 vs. 2001



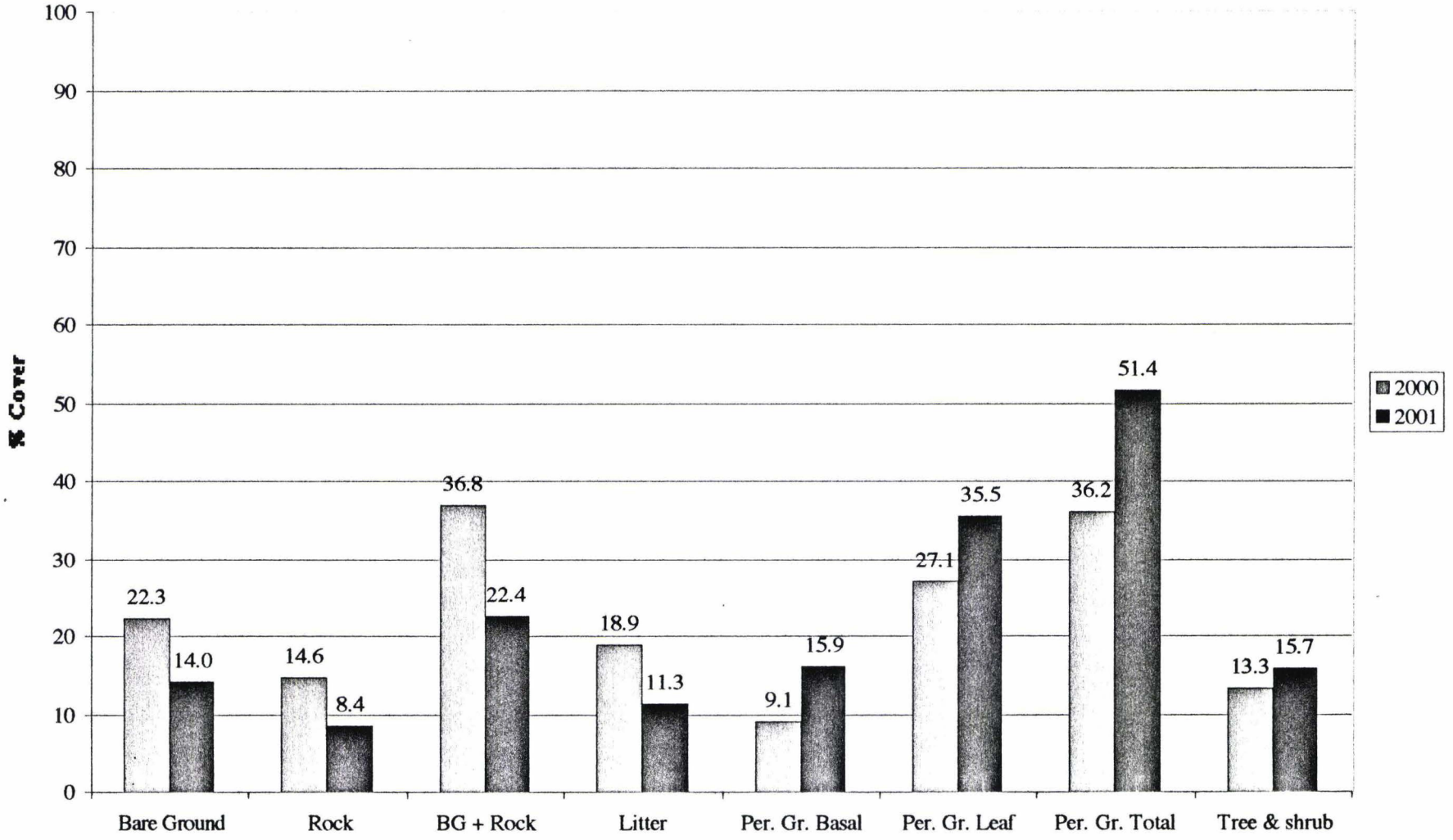
EB 00v01

Watershed F
2000 vs. 2001



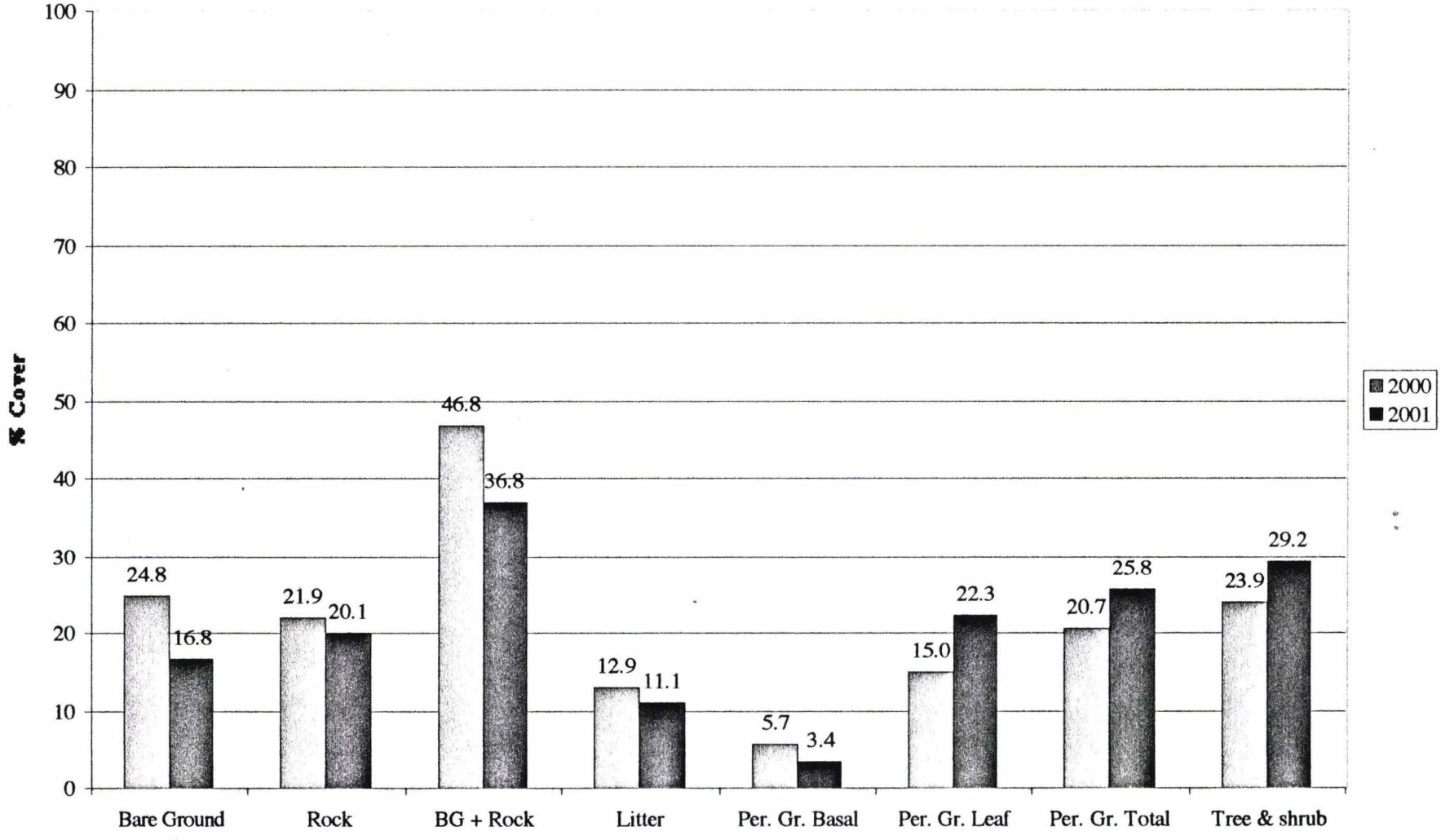
F 00v01

Watershed G
2000 vs. 2001



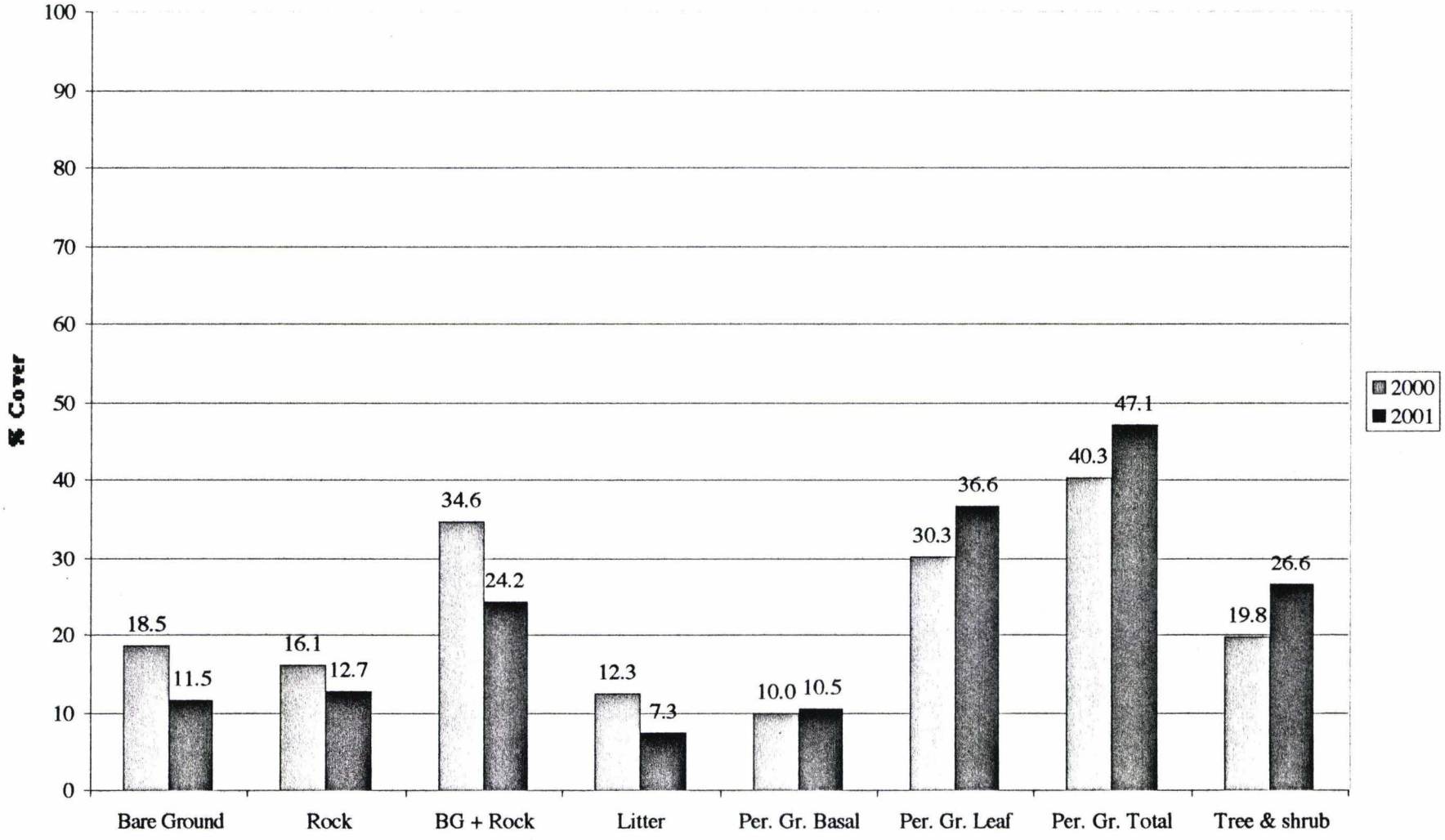
G 00v01

Watershed H
2000 vs. 2001



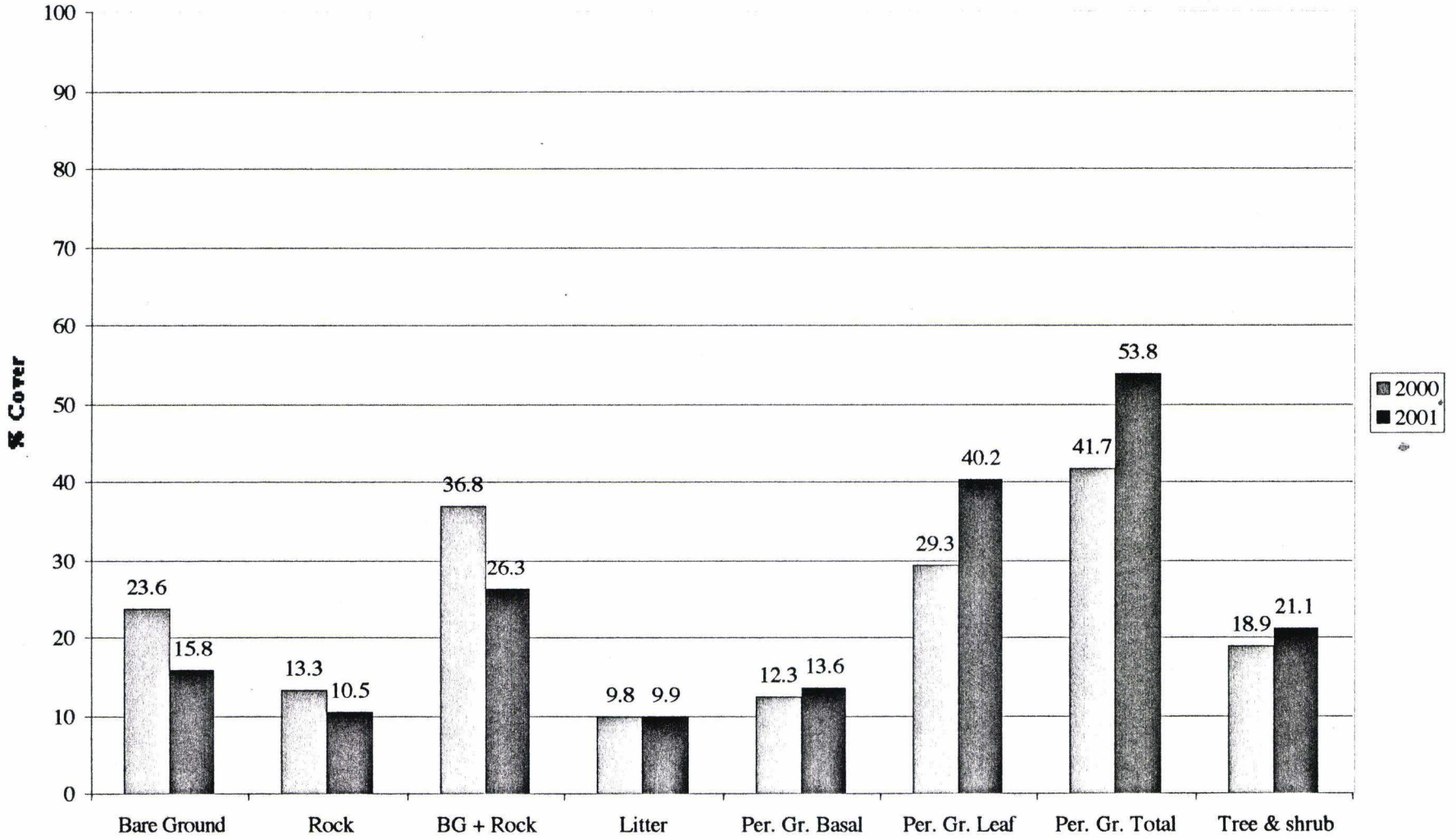
H 00v01

Watershed I
2000 vs. 2001



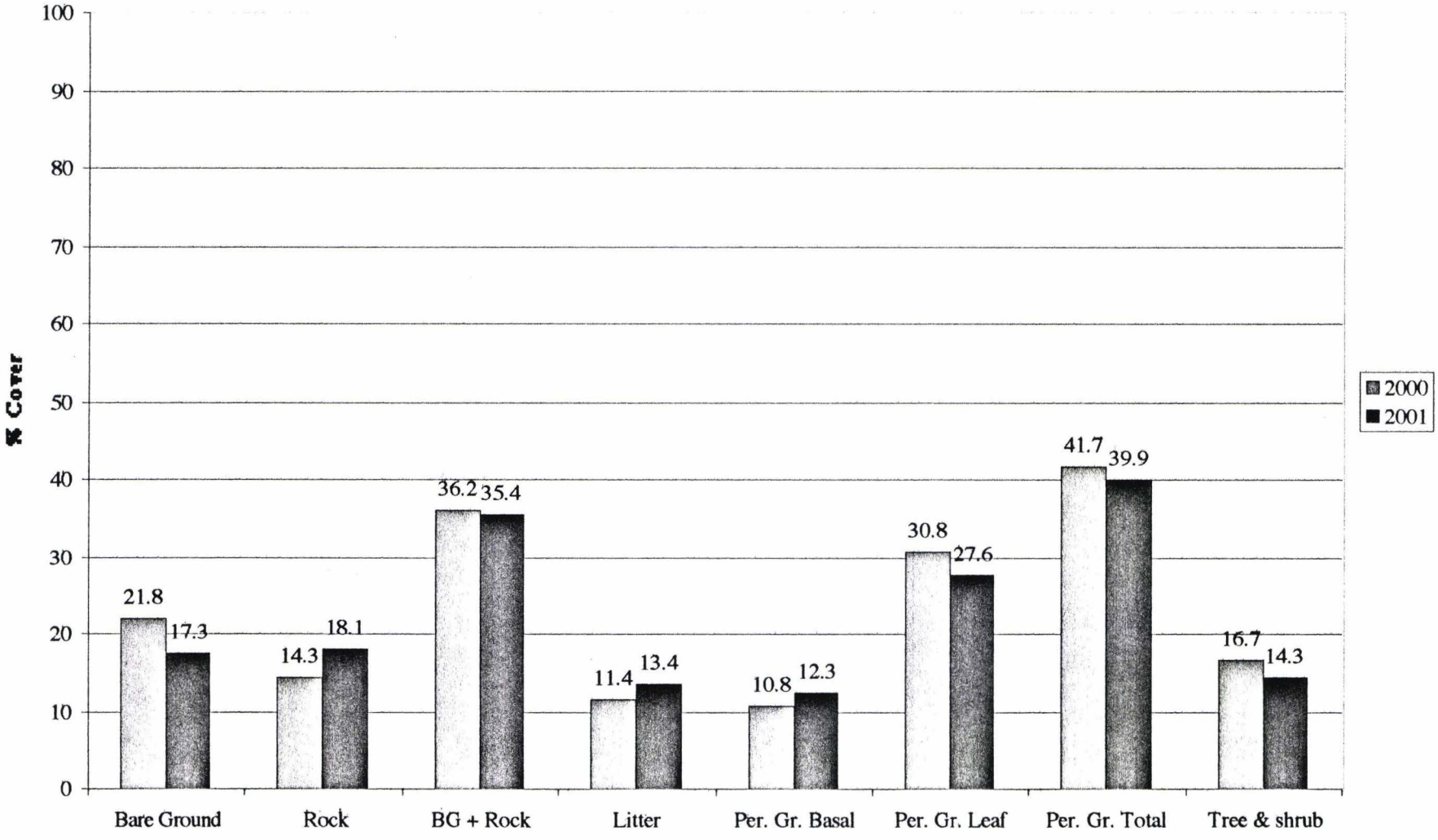
I 00v01

Watershed J2
2000 vs. 2001



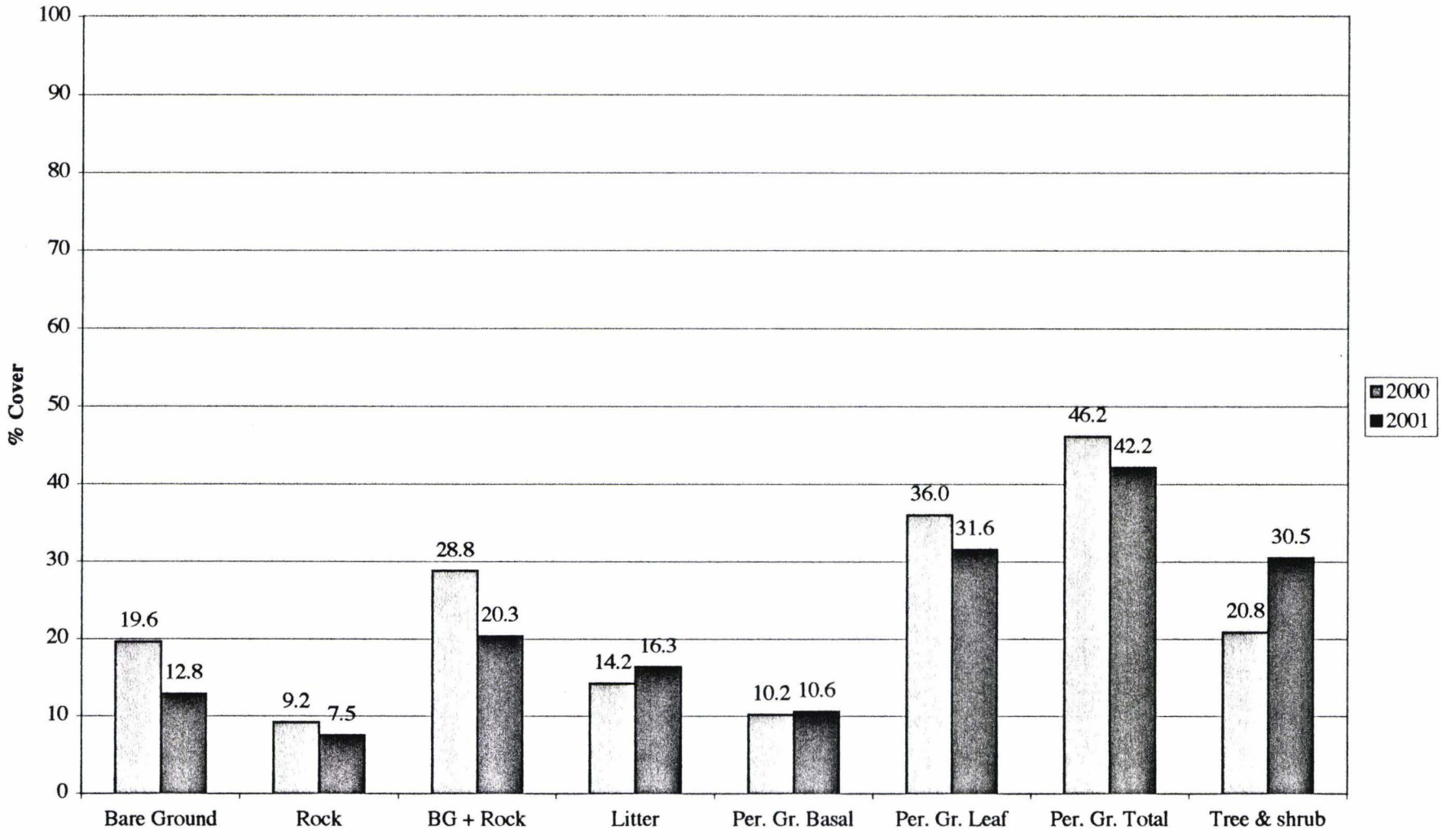
J2 00v01

Watershed K
2000 vs. 2001



K 00v01

Watershed M
2000 vs. 2001



Appendix B

2000 vs. 2001 t-test results

A	2000	2001	p< 0.05
Bare Ground	10.3	7.0	0.041
Rock	15.4	13.4	0.294
BG + Rock	25.8	20.4	0.077
Litter	10.6	10.0	0.779
Per. Gr. Basal	12.3	11.8	0.830
Per. Gr. Leaf	35.2	39.1	0.224
Per. Gr. Total	47.5	50.8	0.547
Tree & shrub	25.4	31.3	0.032

B	2000	2001	p< 0.05
Bare Ground	18.4	14.0	0.027
Rock	21.7	16.9	0.083
BG + Rock	40.1	30.9	0.023
Litter	9.0	11.7	0.186
Per. Gr. Basal	12.7	9.7	0.074
Per. Gr. Leaf	28.3	34.0	0.084
Per. Gr. Total	40.9	43.7	0.440
Tree & shrub	13.0	14.8	0.498

C	2000	2001	p< 0.05
Bare Ground	22.3	17.7	0.012
Rock	15.5	14.9	0.722
BG + Rock	37.8	32.6	0.008
Litter	11.8	14.3	0.127
Per. Gr. Basal	11.2	6.4	0.002
Per. Gr. Leaf	21.0	34.7	0.000
Per. Gr. Total	32.2	41.1	0.005
Tree & shrub	14.8	16.3	0.331

G	2000	2001	p< 0.05
Bare Ground	22.3	14.0	0.000
Rock	14.6	8.4	0.008
BG + Rock	36.8	22.4	0.000
Litter	18.9	11.3	0.001
Per. Gr. Basal	9.1	15.9	0.003
Per. Gr. Leaf	27.1	35.5	0.010
Per. Gr. Total	36.2	51.4	0.000
Tree & shrub	13.3	15.7	0.565

H	2000	2001	p< 0.05
Bare Ground	24.8	16.8	0.002
Rock	21.9	20.1	0.266
BG + Rock	46.8	36.8	0.002
Litter	12.9	11.1	0.142
Per. Gr. Basal	5.7	3.4	0.104
Per. Gr. Leaf	15.0	22.3	0.032
Per. Gr. Total	20.7	25.8	0.140
Tree & shrub	23.9	29.2	0.065

I	2000	2001	p< 0.05
Bare Ground	18.5	11.5	0.001
Rock	16.1	12.7	0.191
BG + Rock	34.6	24.2	0.011
Litter	12.3	7.3	0.005
Per. Gr. Basal	10.0	10.5	0.681
Per. Gr. Leaf	30.3	36.6	0.023
Per. Gr. Total	40.3	47.1	0.035
Tree & shrub	19.8	26.6	0.034

Appendix B
2000 vs. 2001 t-test

EB	2000	2001	p< 0.05
Bare Ground	19.7	17.3	0.245
Rock	14.8	11.4	0.142
BG + Rock	34.4	28.8	0.035
Litter	12.4	8.8	0.013
Per. Gr. Basal	10.2	8.2	0.171
Per. Gr. Leaf	33.3	39.6	0.054
Per. Gr. Total	43.4	47.8	0.201
Tree & shrub	15.6	22.3	0.006

J2	2000	2001	p< 0.05
Bare Ground	23.6	15.8	0.002
Rock	13.3	10.5	0.239
BG + Rock	36.8	26.3	0.002
Litter	9.8	9.9	0.950
Per. Gr. Basal	12.3	13.6	0.345
Per. Gr. Leaf	29.3	40.2	0.028
Per. Gr. Total	41.7	53.8	0.027
Tree & shrub	18.9	21.1	0.423

F	2000	2001	p< 0.05
Bare Ground	21.4	11.7	0.000
Rock	11.3	8.8	0.016
BG + Rock	32.7	20.4	0.000
Litter	18.0	13.8	0.055
Per. Gr. Basal	10.3	13.7	0.064
Per. Gr. Leaf	15.5	34.3	0.001
Per. Gr. Total	25.8	47.9	0.000
Tree & shrub	16.8	18.0	0.482

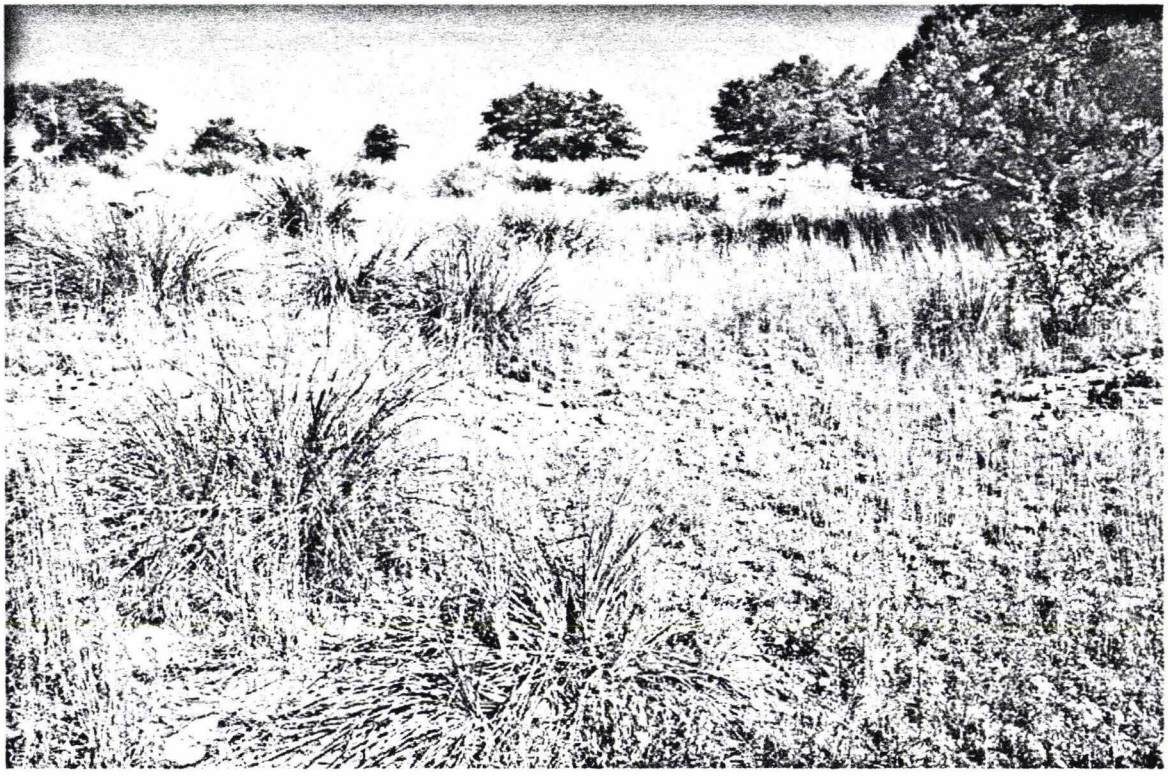
K	2000	2001	p< 0.05
Bare Ground	21.8	17.3	0.077
Rock	14.3	18.1	0.234
BG + Rock	36.2	35.4	0.862
Litter	11.4	13.4	0.322
Per. Gr. Basal	10.8	12.3	0.536
Per. Gr. Leaf	30.8	27.6	0.223
Per. Gr. Total	41.7	39.9	0.670
Tree & shrub	16.7	14.3	0.536

M	2000	2001	p< 0.05
Bare Ground	19.6	12.8	0.025
Rock	9.2	7.5	0.315
BG + Rock	28.8	20.3	0.026
Litter	14.2	16.3	0.243
Per. Gr. Basal	10.2	10.6	0.750
Per. Gr. Leaf	36.0	31.6	0.389
Per. Gr. Total	46.2	42.2	0.500
Tree & shrub	20.8	30.5	0.039

Appendix B
2000 vs. 2001 t-test

Appendix C

Transect data used for analysis



A 2000	0m	20m	40m	60m	80m	100m	0m	20m	40m	60m	80m	100m	Mean	SD	95% CI	p value 00 vs. 01
Bare Ground	12	4	11	9	8	5	18	5	16	10	17	9	10.33	4.72	2.67	0.041
Rock	15	9	22	9	20	0	16	19	26	15	18	16	15.42	6.86	3.88	0.294
BG + Rock	27	13	33	18	28	5	34	24	42	25	35	25	25.75	10.15	5.75	0.077
Litter	10	7	6	9	10	5	14	8	10	11	13	24	10.58	4.98	2.82	0.779
Per. Gr. Bas.	16	7	15	22	15	13	3	15	12	6	15	9	12.33	5.25	2.97	0.830
Per. Gr. Leaf	41	44	31	42	33	55	26	36	29	27	27	31	35.17	8.78	4.97	0.224
Per. Gr. Total	57	51	46	64	48	68	29	51	41	33	42	40	47.50	11.64	6.59	0.547
Tree & shrub cover	7	42	11	26	22	47	26	32	13	38	16	25	25.42	12.59	7.13	0.032
Plot A was labeled B in 2000. Corrections were made for this analysis.																
A 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	6	4	17	9	7	7	8	2	9	6	6	3	7.00	3.84	2.17	4.277
Rock	19	5	21	15	29	3	14	8	18	8	11	10	13.42	7.45	4.22	7.154
BG + Rock	25	9	38	24	36	10	22	10	27	14	17	13	20.42	9.94	5.62	10.047
Litter	22	9	11	9	12	11	9	1	9	11	7	9	10.00	4.73	2.68	4.855
Per. Gr. Bas.	10	6	8	4	5	4	13	25	19	11	21	15	11.75	7.02	3.97	6.133
Per. Gr. Leaf	33	41	22	42	27	48	37	45	38	41	46	49	39.08	8.30	4.69	8.537
Per. Gr. Total	43	47	30	46	32	52	50	70	57	52	67	64	50.83	12.55	7.10	12.095
Tree & shrub cover	10	50	11	36	26	43	22	59	17	43	21	38	31.33	15.81	8.94	14.201
B 2000	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**p value 00 vs. 01**
Bare Ground	18	15	18	18	16	26	16	19	17	23	16	19	18.42	3.18	1.80	0.027
Rock	18	19	24	20	16	16	30	18	37	17	17	28	21.67	6.71	3.79	0.083
BG + Rock	36	34	42	38	32	42	46	37	54	40	33	47	40.08	6.52	3.69	0.023
Litter	9	12	9	12	12	5	5	9	6	10	11	8	9.00	2.59	1.47	0.186
Per. Gr. Bas.	10	19	14	13	9	9	12	12	14	12	13	15	12.67	2.77	1.57	0.074
Per. Gr. Leaf	27	26	27	28	31	28	29	32	22	31	34	24	28.25	3.41	1.93	0.084
Per. Gr. Total	37	45	41	41	40	37	41	44	36	43	47	39	40.92	3.40	1.92	0.440
Tree & shrub cover	20	26	8	15	19	20	11	12	3	4	9	9	13.00	7.07	4.00	0.498
B 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	26	19	15	12	16	19	12	8	13	12	6	10	14.00	5.46	3.09	4.318
Rock	23	24	6	28	6	19	27	8	24	15	9	14	16.92	8.31	4.70	7.506
BG + Rock	49	43	21	40	22	38	39	16	37	27	15	24	30.92	11.38	6.44	8.948
Litter	6	10	7	15	3	14	8	17	20	11	21	8	11.67	5.73	3.24	4.160
Per. Gr. Bas.	8	6	17	9	15	12	10	8	7	10	6	8	9.67	3.45	1.95	3.110
Per. Gr. Leaf	26	21	40	25	41	21	32	31	38	47	35	51	34.00	9.80	5.54	6.606
Per. Gr. Total	34	27	57	34	56	33	42	39	45	57	41	59	43.67	11.10	6.28	7.247
Tree & shrub cover	9	21	17	4	29	19	12	15	0	14	26	11	14.75	8.42	4.77	7.747

Appendix C
Transect data

C 2000	0m	20m	40m	60m	80m	100m	0m	20m	40m	60m	80m	100m	Mean	SD	95% CI	p value 00 vs. 01
Bare Ground	29	30	23	20	26	38	21	15	11	17	16	21	22.25	7.52	4.26	0.012
Rock	18	15	20	15	19	14	19	14	4	18	10	20	15.50	4.72	2.67	0.722
BG + Rock	47	45	43	35	45	52	40	29	15	35	26	41	37.75	10.38	5.87	0.008
Litter	11	6	8	16	12	4	10	22	15	14	11	12	11.75	4.77	2.70	0.127
Per. Gr. Bas.	7	12	11	12	7	11	20	10	10	9	16	9	11.17	3.69	2.09	0.002
Per. Gr. Leaf	11	13	16	12	15	14	25	26	25	23	41	31	21.00	9.13	5.16	0.000
Per. Gr. Total	18	25	27	24	22	25	45	36	35	32	57	40	32.17	11.14	6.30	0.005
Tree & shrub cover	17	10	23	11	15	13	10	14	18	18	14	14	14.75	3.79	2.15	0.331
This plot was labeled D in 2000. Converted to C in 2001																
C 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	19	28	17	21	17	22	16	16	7	19	10	20	17.67	5.43	3.07	6.477
Rock	17	15	24	12	11	19	23	9	10	10	16	13	14.92	5.05	2.86	4.886
BG + Rock	36	43	41	33	28	41	39	25	17	29	26	33	32.58	7.87	4.45	9.122
Litter	11	15	14	26	17	9	5	18	10	17	17	12	14.25	5.41	3.06	5.091
Per. Gr. Bas.	7	5	9	6	11	4	10	5	5	3	6	6	6.42	2.43	1.37	3.059
Per. Gr. Leaf	29	30	25	29	32	36	36	40	43	37	38	41	34.67	5.60	3.17	7.362
Per. Gr. Total	36	35	34	35	43	40	46	45	48	40	44	47	41.08	5.11	2.89	8.125
Tree & shrub cover	21	12	22	15	17	16	14	7	31	13	12	15	16.25	6.14	3.47	4.965
EB 2000	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**p value 00 vs. 01**
Bare Ground	12	19	22	19	24	22	24	14	15	31	12	22	19.67	5.68	3.21	0.245
Rock	22	27	16	11	14	15	17	12	18	12	3	10	14.75	6.11	3.46	0.142
BG + Rock	34	46	38	30	38	37	41	26	33	43	15	32	34.42	8.31	4.70	0.035
Litter	22	10	11	16	6	12	12	23	3	12	10	12	12.42	5.73	3.24	0.013
Per. Gr. Bas.	12	17	9	14	6	15	10	8	9	11	6	5	10.17	3.79	2.14	0.171
Per. Gr. Leaf	20	25	29	33	36	34	36	37	35	26	51	37	33.25	7.84	4.44	0.054
Per. Gr. Total	32	42	38	47	42	49	46	45	44	37	57	42	43.42	6.36	3.60	0.201
Tree & shrub cover	8	6	13	11	27	7	4	9	31	8	45	18	15.58	12.52	7.09	0.006
EB 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	16	22	12	11	19	25	18	15	19	15	11	25	17.33	4.92	2.79	5.301
Rock	6	12	11	6	5	9	23	14	20	16	2	13	11.42	6.27	3.55	6.190
BG + Rock	22	34	23	17	24	34	41	29	39	31	13	38	28.75	8.99	5.08	8.646
Litter	16	5	12	7	7	10	8	14	7	4	8	8	8.83	3.56	2.02	4.646
Per. Gr. Bas.	15	13	8	6	3	5	12	2	4	13	11	6	8.17	4.45	2.52	4.117
Per. Gr. Leaf	41	33	42	53	49	38	34	37	25	41	46	36	39.58	7.56	4.28	7.701
Per. Gr. Total	56	46	50	59	52	43	46	39	29	54	57	42	47.75	8.70	4.92	7.529
Tree & shrub cover	18	8	21	34	32	7	10	22	32	14	54	15	22.25	13.69	7.75	13.107

Appendix C
Transect data

F 2000	0m	20m	40m	60m	80m	100m	0m	20m	40m	60m	80m	100m	Mean	SD	95% CI	p value 00 vs. 01
Bare Ground	25	15	13	22	26	14	27	13	20	23	26	33	21.42	6.49	3.67	0.000
Rock	8	7	7	17	8	18	13	7	11	7	12	20	11.25	4.79	2.71	0.016
BG + Rock	33	22	20	39	34	32	40	20	31	30	38	53	32.67	9.45	5.35	0.000
Litter	19	11	11	16	13	15	20	21	26	29	16	19	18.00	5.56	3.15	0.055
Per. Gr. Bas.	11	10	7	8	18	9	10	14	14	10	10	3	10.33	3.80	2.15	0.064
Per. Gr. Leaf	19	38	33	26	24	28	18	0	0	0	0	0	15.50	14.68	8.31	0.001
Per. Gr. Total	30	48	40	34	42	37	28	14	14	10	10	3	25.83	14.98	8.48	0.000
Tree & shrub cover	24	33	40	11	11	14	14	18	15	6	15	0	16.75	11.05	6.25	0.482
F 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	8	8	8	11	10	11	11	11	7	20	9	26	11.67	5.63	3.19	6.059
Rock	6	5	3	13	10	13	8	4	7	12	9	15	8.75	3.91	2.21	4.350
BG + Rock	14	13	11	24	20	24	19	15	14	32	18	41	20.42	8.77	4.96	9.113
Litter	24	10	12	2	15	11	15	23	18	14	15	7	13.83	6.19	3.50	5.875
Per. Gr. Bas.	9	13	12	26	16	12	13	13	16	16	8	10	13.67	4.70	2.66	4.247
Per. Gr. Leaf	43	35	57	27	36	29	29	31	29	26	39	30	34.25	8.80	4.98	11.742
Per. Gr. Total	52	48	69	53	52	41	42	44	45	42	47	40	47.92	8.03	4.54	11.506
Tree & shrub cover	18	40	30	14	17	20	18	13	10	10	21	5	18.00	9.44	5.34	10.243
G 2000	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**p value 00 vs. 01**
Bare Ground	24	26	26	17	17	23	17	26	22	30	13	26	22.25	5.12	2.90	0.000
Rock	9	14	8	14	12	20	7	17	13	19	24	18	14.58	5.20	2.94	0.008
BG + Rock	33	40	34	31	29	43	24	43	35	49	37	44	36.83	7.21	4.08	0.000
Litter	15	14	22	31	12	18	28	20	12	17	17	21	18.92	5.93	3.36	0.001
Per. Gr. Bas.	4	10	6	9	10	13	12	9	10	10	4	12	9.08	2.97	1.68	0.003
Per. Gr. Leaf	36	25	30	18	37	18	38	24	33	24	24	18	27.08	7.51	4.25	0.010
Per. Gr. Total	40	35	36	27	47	31	50	33	43	34	28	30	36.17	7.40	4.18	0.000
Tree & shrub cover	19	10	11	17	22	9	10	22	9	2	24	4	13.25	7.33	4.14	0.565
G 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	17	18	22	14	13	11	8	17	12	11	6	19	14.00	4.73	2.68	4.924
Rock	9	5	15	15	7	5	5	3	5	9	13	10	8.42	4.14	2.34	4.670
BG + Rock	26	23	37	29	20	16	13	20	17	20	19	29	22.42	6.75	3.82	6.979
Litter	13	10	11	9	10	7	21	11	11	14	10	9	11.33	3.55	2.01	4.741
Per. Gr. Bas.	17	18	18	17	24	19	17	16	11	3	18	13	15.92	5.14	2.91	4.055
Per. Gr. Leaf	31	40	24	36	30	32	48	31	48	32	37	37	35.50	7.17	4.05	7.340
Per. Gr. Total	48	58	42	53	54	51	65	47	59	35	55	50	51.42	7.97	4.51	7.683
Tree & shrub cover	14	32	6	0	11	9	17	17	17	30	14	21	15.67	9.13	5.16	8.227

Appendix C
Transect data

H 2000	0m	20m	40m	60m	80m	100m	0m	20m	40m	60m	80m	100m	Mean	SD	95% CI	p value 00 vs. 01
Bare Ground	18	30	23	22	21	15	33	14	27	22	33	40	24.83	7.92	4.48	0.002
Rock	21	30	20	17	18	21	25	30	20	25	18	18	21.92	4.56	2.58	0.266
BG + Rock	39	60	43	39	39	36	58	44	47	47	51	58	46.75	8.34	4.72	0.002
Litter	11	14	8	10	18	9	14	23	7	22	7	12	12.92	5.52	3.12	0.142
Per. Gr. Bas.	13	9	8	5	2	5	7	3	4	1	7	4	5.67	3.34	1.89	0.104
Per. Gr. Leaf	25	12	21	15	14	15	7	9	22	12	10	18	15.00	5.54	3.14	0.032
Per. Gr. Total	38	21	29	20	16	20	14	12	26	13	17	22	20.67	7.48	4.23	0.140
Tree & shrub cover	11	7	21	39	31	44	14	21	26	22	39	12	23.92	12.16	6.88	0.065
H 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	19	16	16	15	14	7	29	14	21	16	17	17	16.75	5.12	2.90	6.519
Rock	17	21	18	18	17	10	28	28	25	18	25	16	20.08	5.43	3.08	4.998
BG + Rock	36	37	34	33	31	17	57	42	46	34	42	33	36.83	9.62	5.44	8.977
Litter	7	10	5	11	15	5	14	19	8	12	12	15	11.08	4.32	2.44	4.917
Per. Gr. Bas.	3	7	0	2	5	8	3	5	1	4	1	2	3.42	2.47	1.40	2.903
Per. Gr. Leaf	42	35	36	25	23	30	8	13	8	23	13	12	22.33	11.65	6.59	8.596
Per. Gr. Total	45	42	36	27	28	38	11	18	9	27	14	14	25.75	12.55	7.10	10.012
Tree & shrub cover	23	13	30	35	20	48	14	21	43	35	38	30	29.17	11.17	6.32	11.668
I 2000	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**p value 00 vs. 01**
Bare Ground	10	9	13	27	25	17	24	23	18	17	16	23	18.50	5.95	3.36	0.001
Rock	18	10	16	20	15	25	16	14	16	11	17	15	16.08	3.92	2.22	0.191
BG + Rock	28	19	29	47	40	42	40	37	34	28	33	38	34.58	7.68	4.35	0.011
Litter	22	8	13	5	9	9	8	14	16	18	16	10	12.33	5.00	2.83	0.005
Per. Gr. Bas.	12	14	8	10	9	12	9	12	10	5	8	11	10.00	2.41	1.36	0.681
Per. Gr. Leaf	31	31	36	30	32	23	38	28	24	26	28	36	30.25	4.77	2.70	0.023
Per. Gr. Total	43	45	44	40	41	35	47	40	34	31	36	47	40.25	5.28	2.99	0.035
Tree & shrub cover	8	51	18	12	15	15	12	16	21	27	29	13	19.75	11.61	6.57	0.034
I 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	6	3	14	14	10	7	13	15	8	15	15	18	11.50	4.58	2.59	5.265
Rock	20	1	20	6	15	9	7	13	8	15	10	28	12.67	7.44	4.21	5.679
BG + Rock	26	4	34	20	25	16	20	28	16	30	25	46	24.17	10.45	5.91	9.066
Litter	11	5	8	5	5	11	10	1	7	12	6	6	7.25	3.25	1.84	4.124
Per. Gr. Bas.	11	19	9	19	13	15	7	6	9	4	6	8	10.50	5.02	2.84	3.715
Per. Gr. Leaf	43	42	37	35	31	44	41	36	37	36	33	24	36.58	5.65	3.20	5.209
Per. Gr. Total	54	61	46	54	44	59	48	42	46	40	39	32	47.08	8.60	4.86	6.937
Tree & shrub cover	8	53	29	8	33	10	32	26	42	20	39	19	26.58	14.25	8.06	12.928

Appendix C
Transect data

J2 2000	0m	20m	40m	60m	80m	100m	0m	20m	40m	60m	80m	100m	Mean	SD	95% CI	p value 00 vs. 01
Bare Ground	26	28	30	14	27	24	29	22	19	21	26	17	23.58	5.04	2.85	0.002
Rock	12	14	15	21	14	16	10	14	7	15	15	6	13.25	4.07	2.30	0.239
BG + Rock	38	42	45	35	41	40	39	36	26	36	41	23	36.83	6.45	3.65	0.002
Litter	14	12	9	8	7	8	9	11	9	5	11	15	9.83	2.89	1.63	0.950
Per. Gr. Bas.	16	9	11	10	11	18	11	15	10	14	13	10	12.33	2.84	1.61	0.345
Per. Gr. Leaf	31	33	30	32	24	32	35	22	27	30	26	30	29.33	3.85	2.18	0.028
Per. Gr. Total	47	42	41	42	35	50	46	37	37	44	39	40	41.67	4.48	2.53	0.027
Tree & shrub cover	4	14	7	27	20	7	16	21	43	24	12	32	18.92	11.42	6.46	0.423
J2 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	24	25	15	17	25	26	16	12	7	8	10	4	15.75	7.79	4.41	6.415
Rock	8	16	25	6	17	12	16	2	7	7	4	6	10.50	6.75	3.82	5.410
BG + Rock	32	41	40	23	42	38	32	14	14	15	14	10	26.25	12.47	7.05	9.460
Litter	10	7	18	8	6	4	13	8	9	9	16	11	9.92	4.06	2.29	3.471
Per. Gr. Bas.	14	11	10	10	13	10	16	17	18	11	17	16	13.58	3.12	1.76	2.978
Per. Gr. Leaf	34	31	22	47	26	28	32	48	46	68	43	57	40.17	13.74	7.77	8.791
Per. Gr. Total	48	42	32	57	39	38	48	65	64	79	60	73	53.75	14.87	8.41	9.674
Tree & shrub cover	6	4	9	18	18	28	13	30	38	35	13	41	21.08	12.86	7.28	12.140
K 2000	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**p value 00 vs. 01**
Bare Ground	16	27	15	21	24	17	30	20	25	25	20	22	21.83	4.57	2.59	0.077
Rock	20	13	8	10	15	13	20	16	16	12	14	15	14.33	3.55	2.01	0.234
BG + Rock	36	40	23	31	39	30	50	36	41	37	34	37	36.17	6.62	3.74	0.862
Litter	14	13	13	18	16	10	6	8	8	12	9	10	11.42	3.55	2.01	0.322
Per. Gr. Bas.	21	11	18	13	9	9	11	12	6	7	6	7	10.83	4.71	2.66	0.536
Per. Gr. Leaf	24	34	33	24	26	37	29	32	30	32	29	40	30.83	4.90	2.77	0.223
Per. Gr. Total	45	45	51	37	35	46	40	44	36	39	35	47	41.67	5.35	3.03	0.670
Tree & shrub cover	9	3	20	20	13	24	6	11	23	19	40	12	16.67	9.97	5.64	0.536
K 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	16	23	15	20	12	20	13	12	35	8	17	17	17.33	6.93	3.92	5.751
Rock	32	20	13	40	12	17	13	13	17	21	7	12	18.08	9.36	5.29	6.453
BG + Rock	48	43	28	60	24	37	26	25	52	29	24	29	35.42	12.41	7.02	9.511
Litter	19	29	22	10	15	15	7	12	3	6	12	11	13.42	7.25	4.10	5.404
Per. Gr. Bas.	10	11	9	4	11	10	11	22	11	22	16	11	12.33	5.23	2.96	4.967
Per. Gr. Leaf	18	13	33	14	34	22	30	39	25	34	26	43	27.58	9.61	5.43	7.251
Per. Gr. Total	28	24	42	18	45	32	41	61	36	56	42	54	39.92	13.11	7.42	9.230
Tree & shrub cover	1	1	12	2	19	20	34	7	8	25	25	18	14.33	10.82	6.12	10.395

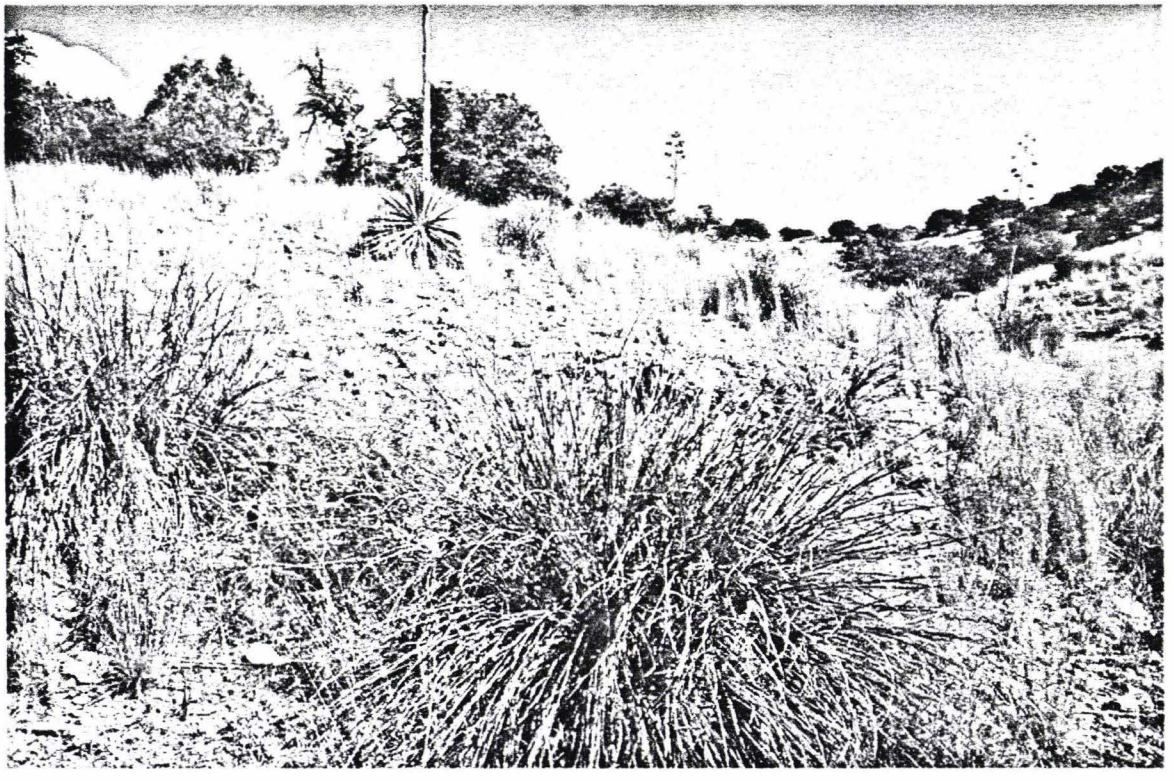
Appendix C
Transect data

M 2000	0m	20m	40m	60m	80m	100m	0m	20m	40m	60m	80m	100m	Mean	SD	95% CI	p value 00 vs. 01
Bare Ground	24	26	16	28	13	18	18	14	20	23	16	19	19.58	4.76	2.69	0.025
Rock	8	8	4	11	11	14	12	4	9	7	10	12	9.17	3.13	1.77	0.315
BG + Rock	32	34	20	39	24	32	30	18	29	30	26	31	28.75	5.91	3.34	0.026
Litter	9	12	12	11	9	20	13	17	10	19	17	21	14.17	4.39	2.48	0.243
Per. Gr. Bas.	16	9	6	7	12	10	14	13	12	8	8	7	10.17	3.19	1.80	0.750
Per. Gr. Leaf	38	25	40	27	46	32	37	45	30	37	43	32	36.00	6.89	3.90	0.389
Per. Gr. Total	54	34	46	34	58	42	51	58	42	45	51	39	46.17	8.38	4.74	0.500
Tree & shrub cover	18	25	47	27	17	16	14	13	37	10	13	13	20.83	11.26	6.37	0.039
M 2001	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	**sigma 00 + 01**
Bare Ground	12	13	18	14	18	10	13	9	2	12	28	5	12.83	6.66	3.77	5.708
Rock	6	3	4	8	6	9	7	18	4	9	9	7	7.50	3.90	2.20	3.512
BG + Rock	18	16	22	22	24	19	20	27	6	21	37	12	20.33	7.64	4.32	6.777
Litter	22	8	22	16	14	12	12	19	13	24	12	22	16.33	5.26	2.98	4.825
Per. Gr. Bas.	11	11	4	12	13	14	8	11	22	7	8	6	10.58	4.68	2.65	3.933
Per. Gr. Leaf	35	46	24	36	34	44	39	10	48	19	28	16	31.58	12.29	6.95	9.588
Per. Gr. Total	46	57	28	48	47	58	47	21	70	26	36	22	42.17	15.65	8.86	12.015
Tree & shrub cover	17	38	43	25	17	32	24	38	28	29	21	54	30.50	11.12	6.29	11.190
N 2001.	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**0m**	**20m**	**40m**	**60m**	**80m**	**100m**	**Mean**	**SD**	**95% CI**	
Bare Ground	21	15	33	11	20	5	23	23	12	10	12	15	16.67	7.62	4.31	
Rock	8	2	5	8	2	4	7	11	4	3	7	2	5.25	2.93	1.66	
BG + Rock	29	17	38	19	22	9	30	34	16	13	19	17	21.92	8.88	5.02	
Litter	38	19	36	20	37	24	23	15	25	18	20	15	24.17	8.34	4.72	
Per. Gr. Bas.	6	21	9	11	10	15	14	11	10	8	10	12	11.42	3.87	2.19	
Per. Gr. Leaf	22	26	13	17	7	30	28	0	0	0	0	0	11.92	12.24	6.92	
Per. Gr. Total	28	47	22	28	17	45	42	11	10	8	10	12	23.33	14.57	8.24	
Tree & shrub cover	5	20	0	37	28	34	7	11	28	43	14	40	22.25	14.75	8.34	
This is the first year for plot N to be sampled.																

Appendix C
Transect data

Appendix D

GPS and marking tag numbers



Plot	Tag #	UTM	Coordinates	Plot	Tag #	UTM	Coordinates
A OP	1	12 R 0690308	UTM 3491614	F OP	49	12 R 0692137	UTM 3490987
A	2			F	50		
A	3			F	51		
A	4			F	52		
A	5			F	53		
A EP	6	12 R 0690280	UTM 3491707	F EP	54	12 R 0692129	UTM 3491091
A OP	7	12 R 0690428	UTM 3491580	F OP	55	12 R 0692129	UTM 3490993
A	8			F	56		
A	9			F	57		
A	10			F	58		
A	11			F	59		
A EP	12	12 R 0690389	UTM 3491672	F EP	60	12 R 0692115	UTM 3491090
B OP	125	12 R 0690708	UTM 3491565	G OP	61	12 R 0692228	UTM 3490722
B	126			G	62		
B	127			G	63		
B	128			G	64		
B	129			G	65		
B EP	130	12 R 0690656	UTM 3491647	G EP	66	12 R 0692262	UTM 3490819
B OP	131	12 R 0690708	UTM 3491560	G OP	67	12 R 0692219	UTM 3490728
B	132			G	68		
B	133			G	69		
B	134			G	70		
B	135			G	71		
B EP	136	12 R 0690649	UTM 3491641	G EP	72	12 R 0692255	UTM 3490824
C OP	37	12 R 0691011	UTM 3491514	H OP	25	12 R 0690046	UTM 3491896
C	38			H	26		
C	39			H	27		
C	40			H	28		
C	41			H	29		
C EP	42	12 R 0691018	UTM 3491600	H OP	30	12 R 0690018	UTM 3491798
C OP	43	12 R 0691004	UTM 3491507	H	31	12 R 0690056	UTM 3491868
C	44			H	32		
C	45			H	33		
C	46			H	34		
C	47			H	35		
C EP	48	12 R 0691001	UTM 3491607	H EP	36	12 R 0690027	UTM 3491768
E OP	113	12 R 0691482	UTM 3491451	I OP	137	12 R 0690511	UTM 3491908
E	114			I	138		
E	115			I	139		
E	116			I	140		
E	117			I	141		
E EP	118	12 R 0691380	UTM 3491461	I EP	142	12 R 0690437	UTM 3491832
E OP	119	12 R 0691485	UTM 3491462	I OP	143	12 R 0690504	UTM 3491909
E	120			I	144		
E	121			I	145		
E	122			I	146		
E	123			I	147		
E EP	124	12 R 0691382	UTM 3491464	I EP	148	12 R 0690432	UTM 3491830

Appendix D
GPS coordinates and tag numbers

Plot	Tag #	UTM	Coordinates				
J OP	85	12 R 0691518	UTM 3492002				
J	86						
J	87						
J	88						
J	89						
J EP	90	12 R 0691433	UTM 3491940				
J OP	91	12 R 0691516	UTM 3492004				
J	92						
J	93						
J	94						
J	95						
J EP	96	12 R 0691435	UTM 3491947				
K OP	73	12 R 0691361	UTM 3491722				
K	74						
K	75						
K	76						
K	77						
K EP	78	12 R 0691279	UTM 3491672				
K OP	79	12 R 0691355	UTM 3491730				
K	80						
K	81						
K	82						
K	83						
K EP	84	12 R 0691269	UTM 3491677				
M OP	101	12 R 0691840	UTM 3491589				
M	102						
M	103						
M	104						
M	105						
M EP	106	12 R 0691745	UTM 3491568				
M OP	107	12 R 0691844	UTM 3491586				
M	108						
M	109						
M	110						
M	111						
M EP	112	12 R 0691743	UTM 3491574				
N OP	13	12 R 0692218	UTM 3491796				
N	14						
N	15						
N	16						
N	17						
N EP	18	12 R 0692230	UTM 3491700				
N OP	19	12 R 0692205	UTM 3491799				
N	20						
N	21						
N	22						
N	23						
N EP	24	12 R 0692209	UTM 3491704				

Appendix D
GPS coordinates and tag numbers

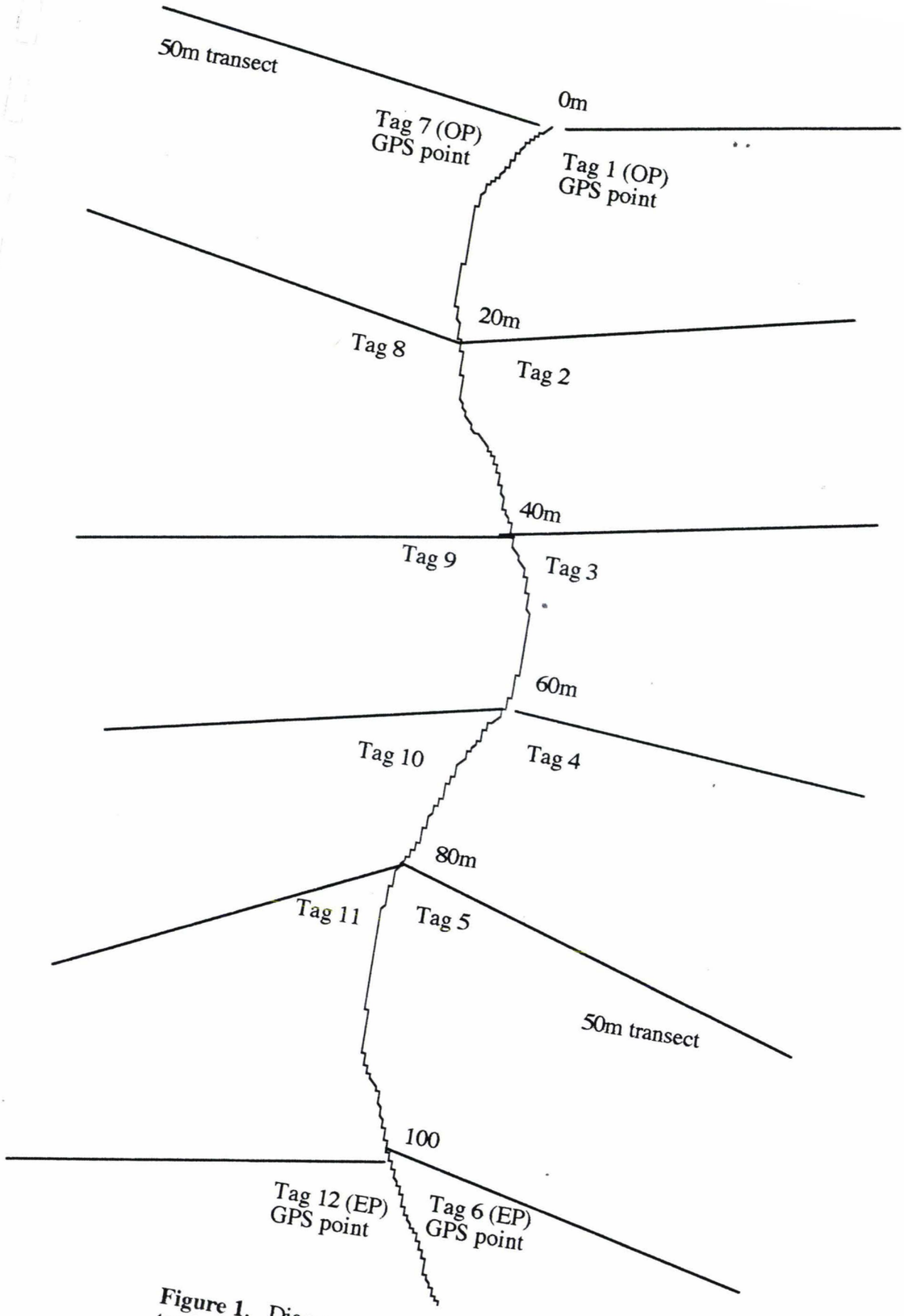


Figure 1. Diagram of photo-point and marking tag locations. Watershed A used for example. OP = Origin Point. EP = End Point

Vegetation Sampling Report for USFS Cascabel Ranch Watershed Research Study Year 2000

submitted by
Myles B. Traphagen
Turn of the Century Restoration & Monitoring Inc.
2833 Belhaven Pl.
Davis, CA 95616
(520) 991-6368

January 30, 2001

Myles B. Traphagen
2833 Belhaven Pl.
Davis, CA 95616
(520) 991-6368

Dear Gerry, 1/30/01

Here is the vegetation report for year 2000 at the Cascabel. Please give me feedback on what you feel are important aspects of the data to analyze and to present in subsequent reports. For this report I felt that the data should be descriptive in nature and focus on describing and characterizing the vegetation. Therefore, the summary table for all plots contains 7 categories that I feel are the most important features of the vegetation /soil component of the landscape. The watersheds are all rather similar in terms of vegetation/soil composition, with the exception of watershed H, and to lesser degree B. H contains so much shrub and tree cover, especially manzanita, that the possibility of an extremely hot fire is high. However, the high amount of bare rock and and low grass cover may mitigate this somewhat. I'm sure that you have taken this into consideration, but I just wanted to draw this particular watershed to your attention.

I may have talked to you about low level aerial photography (< 1000 feet), but you might want to think about this because I think that it may be helpful in getting a good overview of the entire watershed in the event that the plots within the watershed don't burn. I've enclosed a small report describing the method. I'll be working in Argentina until February 28th, so I'll have to wait for the production data until after I get back. I wanted to focus on the watershed data first. The plots were clipped in December, so the data has been collected, I just need to do the calculations on the 36 plots.

Sincerely,

Myles Traphagen

Vegetation Sampling Report for USFS Cascabel Ranch Watershed Research Study Year 2000

Introduction

In November of 2000 vegetation sampling was performed on the Cascabel Ranch allotment of the Coronado National Forest-Peloncillo District. The research site lies immediately north of Whitmire Canyon on the eastern edge of the Peloncillo Mountains in New Mexico approximately 20 miles south of Animas, New Mexico. It is bordered on the east by the Animas Valley. Elevation is approximately 5400 ft. The site lies in the Madrean biogeographic province and the vegetation can be classified as Madrean Evergreen Woodland (Brown & Lowe 1978). Dominant overstory species include Emory oak (*Quercus emoryii*), Gray oak (*Quercus grisea*), Alligator juniper (*Juniperus deppiana*) and Mexican pinyon (*Pinus cembroides*). Shrubs include Skunkbush sumac (*Rhus trilobata*), Wright's silktassel (*Garrya wrightii*), Schott yucca (*Yucca schotti*), Palmer agave (*Agave palmeri*) manzanita (*Arctostapylos hookeri*) and beargrass (*Nolina microphylla*). Several small cacti are also found throughout the site. Perennial grasses are abundant. Of particular note is the dominant presence of purple grama (*Bouteloua radicosa*), which was found in every plot. Other grasses common to virtually every plot are little bluestem (*Schizachrium cirratum*), bull muhly (*Muhlenbergia emersleyi*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*) and wolftail (*Lycurus pheloides*).

A central ridge divides the drainages of Whitmire and Walnut Creeks. An access lies atop this ridge that allows for access to twelve plots. Six plots lie north of the ridge and drain into Walnut Creek, and the remaining six more are south of the ridge and drain into Whitmire Creek. The terrain consists of moderate to steep canyons of about 100 to 400 foot in depth with the plots lying within these canyons. A great deal of rock is exposed and soil depths are shallow within the canyons.

Description of plots

A total of 24 plots were established at the site, 2 for each watershed. All watersheds have either west-east or north-south aspects, therefore a plot was placed on either side of the watershed so that both aspects could be captured. Slope aspect caused no significant difference in vegetation composition on either side of the watershed. The size of the plots are 50m by 100m. There are 6 transects of 50m length that start about 2m up from the bottom of the drainage and extend towards the top of the watershed (see Figure A). Therefore, each watershed contains twelve 50m transects. Each transect contains 25, 40cm x 40cm quadrats to measure frequency. 100 point line intercept data points are taken to measure cover. Therefore, each watershed contains 300 quadrats to measure frequency and 1200 points to measure cover.

Methodology

The plot measures 50 x 100m and contains 6 parallel transects of 50m in length. Transects are spaced 20m apart along the 100m baseline which runs parallel to the creek bottom(see fig. 1). The first transect sampled is on the 0m baseline and the last transect sampled is 100m. 40cm square quadrats are placed at 2m intervals along each of the transects starting at 2m and ending at 50m for a total of 25 quadrats per transect and 150 for the entire plot. Within each frame all species are recorded on data sheets. Each species encountered is recorded only once despite its abundance or lack thereof in the quadrat. Example: Within the frame (40cm square) 10 purple grama plants are present and 1 sideoats plant is present. Despite the vastly different ratio of purple to sideoats grama, they each receive only 1 entry on the data sheet. It is simply a presence/absence of measurement that is ultimately averaged out over the entire plot. Cover measurements are then taken from the same quadrat immediately after measuring frequency. A point (a thin poker stick such as a marking flag or dowel rod) is dropped in each of the four corners of the frame. Whatever object the point strikes is the object recorded, with multiple hits being allowed. This measures canopy cover, therefore any part of a plant hit is recorded on the data sheet. Soil and litter are exclusive hits; i.e. you can't get a hit on purple grama and soil or litter at the same time. Soil is recorded only if no plant material is struck by the point. Litter is compacted, organic matter and grounded dead plant material. 4 "hits" are taken per quadrat for a total of 100 data points per transect and 600 data points for the entire plot. Since each watershed contains 2 plots, the total number of cover data points is 1200.

The sampling unit is the transect, which contains 100 points. This is appropriate when a high degree of variability exists between each data point and when monitoring multiple variables such as species, bare ground and litter composition. Therefore, confidence intervals are calculated using the averages of all the transects in the plot as opposed to within an individual transect.

Cover

Cover is useful in obtaining measurements of soil, rock and litter, a measurement frequency is not capable of. Cover is a common measure of community composition and most directly relates to biomass (Elzinga, et al 1998). Unlike frequency, which is a measurement of species occurrence within a given plot, cover measurements produce values which reflect the actual percentage of a given species (or bare ground/litter) in the plot. Therefore, cross site comparisons can be made regardless of plot size. A disadvantage of cover is that it is subject to high variability throughout the course of a season. This is due to the fact that rainfall and herbivory can have a dramatic effect upon plant size. If a population of grasses is grazed before the plot is sampled, then low cover values may be reported. However, the same number of plants may still exist within the plot, and within a few weeks the population could regain its original biomass, therefore increasing cover values. Basal cover, which measures only the central, rooted mass of a plant is less subject to variation throughout the season, but results obtained are less accurate. A pilot study conducted in spring of 2000 on the Armendaris Ranch found that it was impossible to detect a 20% change in basal cover of black grama at an 80% confidence interval using the point-intercept method, yet it is common for researchers to report small changes in basal cover (Traphagen and Sundt in prep.). Walker (1970), working in grasslands of Rhodesia, reported the same problem when measuring plants with small basal area. He concluded that 2000 points would be required to detect a 10% change in cover at the 95% confidence interval of a plant with only 8% cover. Aerial cover, which combines canopy and basal measurements, is therefore a more accurate method for reporting cover values of species with small basal areas (Traphagen and Sundt, in prep.).

Frequency

Frequency offers several advantages over cover and density measurements. One of the principle uses of frequency is for tracking changes in species composition over time. When active management and restoration is underway this could be especially important information for land managers. Frequency is also useful in plots containing a relatively high degree of species diversity and is therefore a good tool for obtaining an index of diversity because of the ability of frequency to detect small species with low relative cover. Another advantage of using frequency is that it is subject to a smaller degree of variation over the season than cover, because changes in the density of rooted species within a season are usually small (Elzinga, et al 1998). Cover values can change dramatically over a short period of time because they are much more subject to perturbations of climate and herbivory. Therefore, the season for sampling can be extended for a greater amount of time when using frequency. A disadvantage of frequency is that the values obtained are based upon quadrat and plot size and the distribution of the species being measured. Therefore, cross site comparisons cannot be made unless the plots were identical in size and sampling intensity and plant ecology.

Results

Appendix A contains a table that summarizes the results of all 24 plots. Six categories were used to separate data into the most relevant variables; Bare ground, rock, litter, perennial grass basal cover, perennial grass aerial (leaf) cover and perennial grass combined basal and aerial cover. Aerial cover of vegetation is measured because of the soil protection it offers from rain impact and wind erosion. Basal cover could be an important factor affecting overland sheet flow of precipitation runoff, a potentially important variable to measure for in this study. Percentages shown represent the mean for each plot using 6, 50m transects. Below the main table there is a summary of all plots showing the basic statistics of mean, standard deviation (SD), standard error (SE) and the 95% confidence interval. The purpose of this summary table for all plots is so that a comparison can be made to asses similarity and dissimilarity between plots.

The summary table for all plots is graphed using an X Y scatter plot. Total perennial grass cover and bare ground were graphed, as they are the two most important variables used to asses the variance between plots. The plots are all aligned on the Y axis, which is the mean for all plots combined. Along the X axis the plots are aligned according to their individual means, therefore plots the plots that are most similar to each other are centered around the mean and clustered together. Outliers are labeled and can be easily discerned. Watersheds B and H are the most unlike the majority in terms of bare ground and perennial grass cover. B lies on the south side of the central ridge and drains into Whitmire Creek, and H is on the north side of the central ridge and drains into Walnut Creek. Tree and shrub cover is more variable between plots, but this may be more attributable to sampling design and error than actual values present at each plot.

Literature Cited

Brown, David E. Charles H. Lowe. 1980. Biotic Communities of the Southwest. USDA Forest Service Technical Report RM-78. Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado.

Elzinga, C.L., D.W. Salzer and J.W. Willoughby. 1998. Measuring and Monitoring Plant Populations. BLM Technical Reference 1730-1.

Walker B.H. 1970. An evaluation of eight methods of botanical analysis on grasslands in Rhodesia. Journal of Applied Ecology. 7: 403-416.

Wilhite D.A. & K.G. Hubbard 1998 in: An Atlas of the Sand Hills. Ann S. Bleed and Charles Flowerday editors. 3rd edition. Resource atlas no. 5b. Conservation and Survey Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

GPS Coordinates

GPS coordinates were taken at each plot using UTM. Estimated position error was calculated at 3m using a Garmin GPS II+.

Watershed	GPS	Coordinate
M	**12 R 0691746**	**UTM 3491570**
EB	**12 R 0691422**	**UTM 3491456**
K	**12 R 0691272**	**UTM 3491632**
F	**12 R 0692127**	**UTM 3491090**
G	**12 R 0692257**	**UTM 3490826**
C	**12 R 0690654**	**UTM 3491649**
N	**12 R 0691941**	**UTM 3491466**
D	**12 R 0691016**	**UTM 3491586**
I	**12 R 0690435**	**UTM 3491844**
J2	**12 R 0691380**	**UTM 3491928**
B	**12 R 0690307**	**UTM 3491609**
H	**12 R 0690049**	**UTM 3491894**

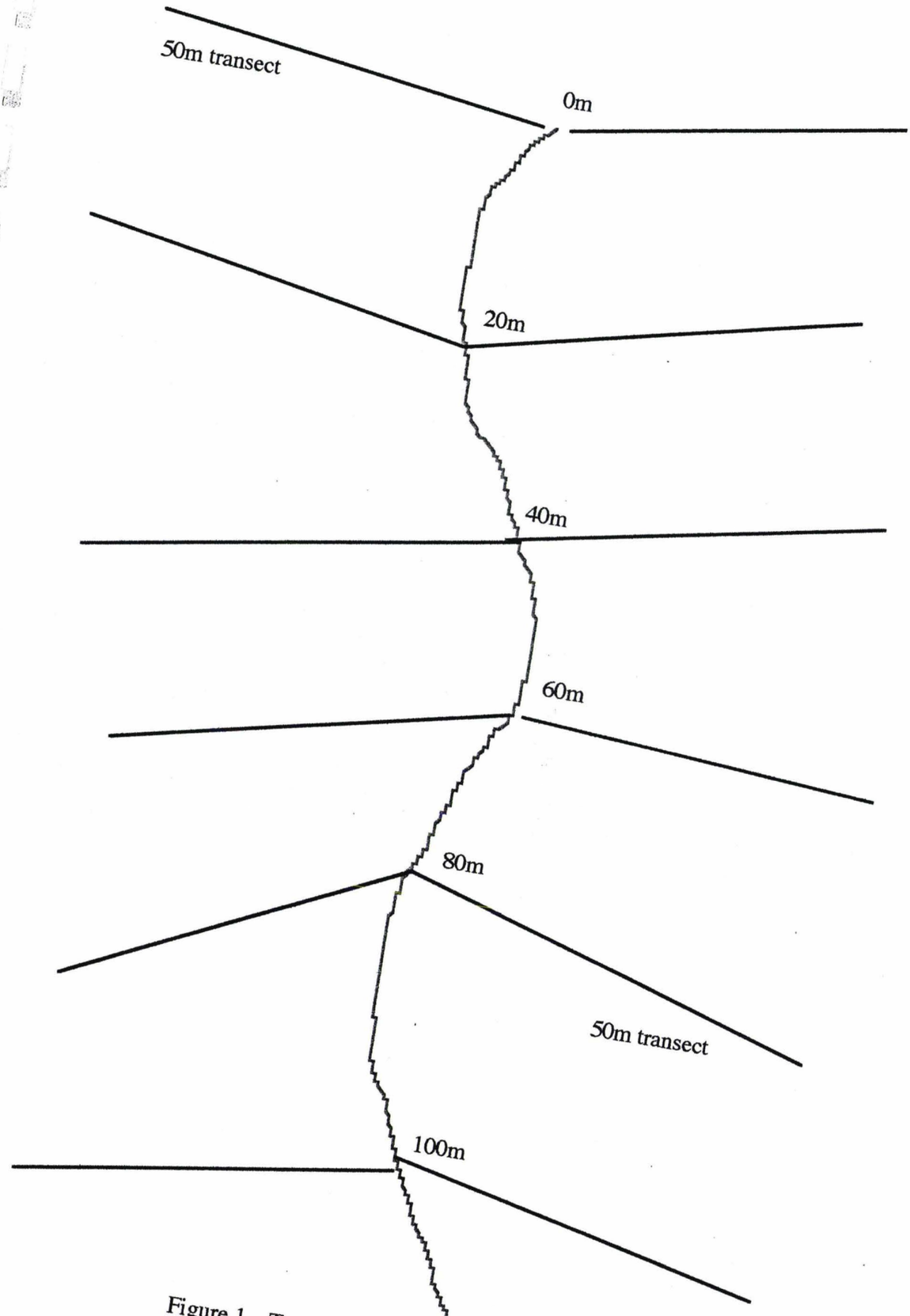
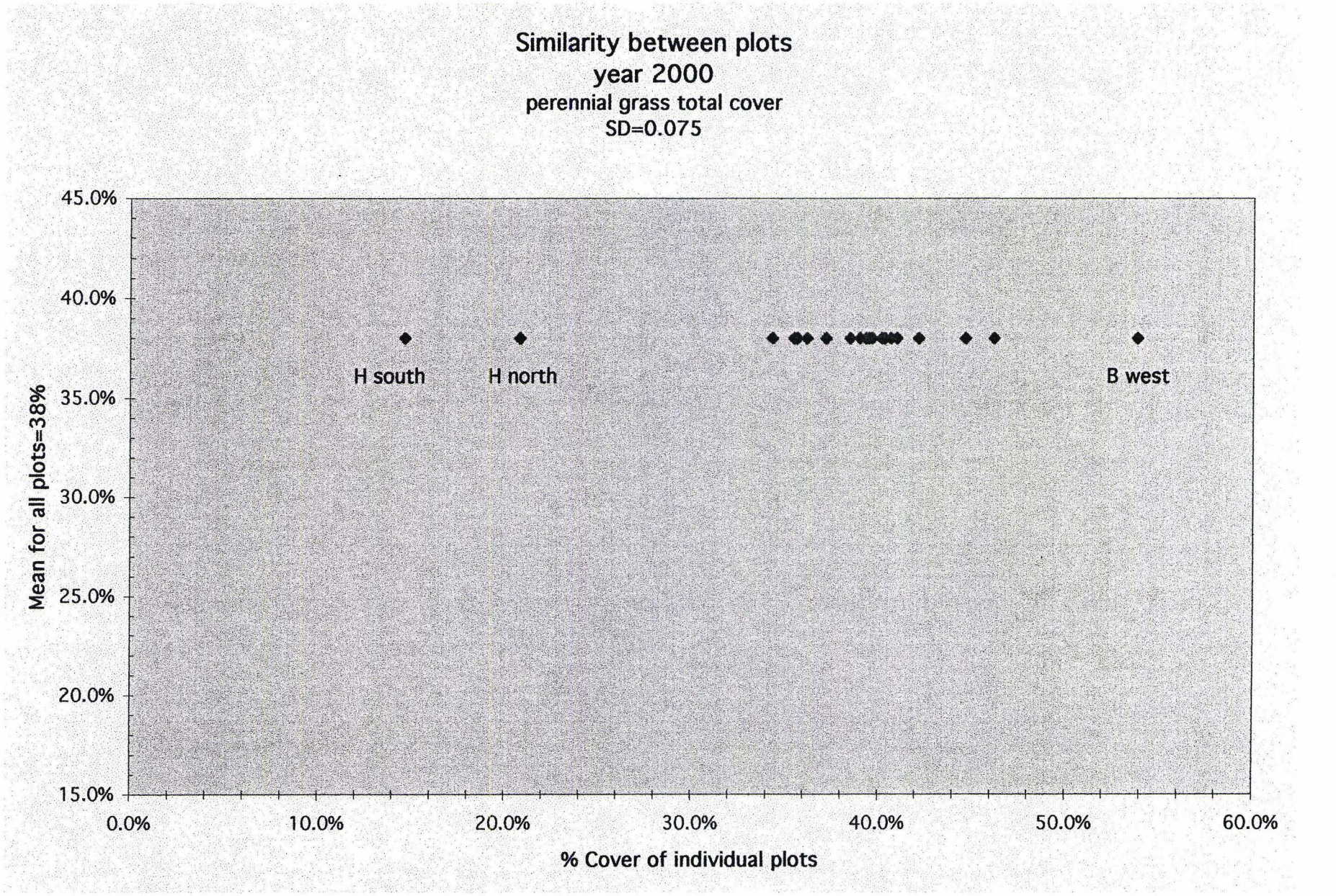
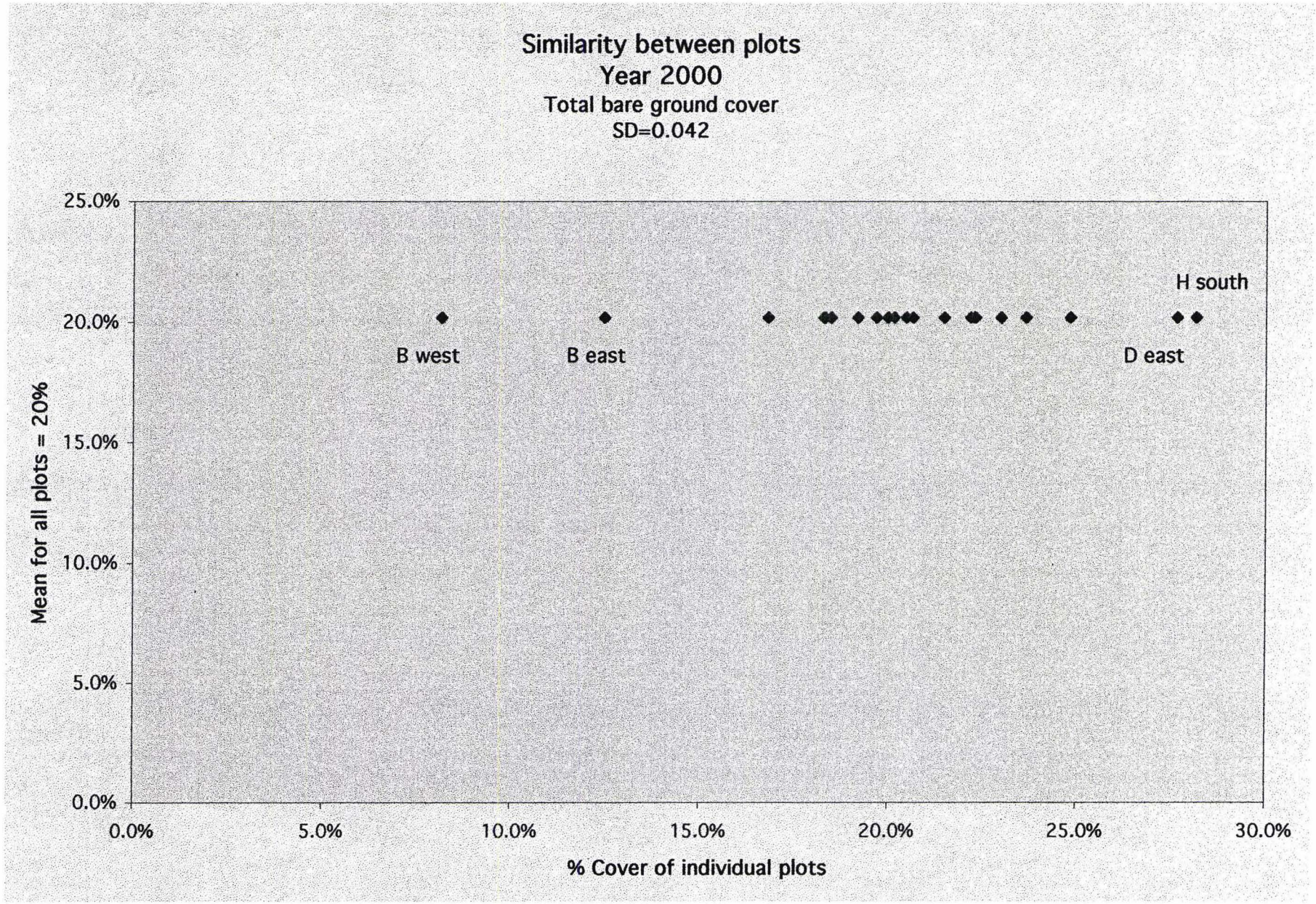


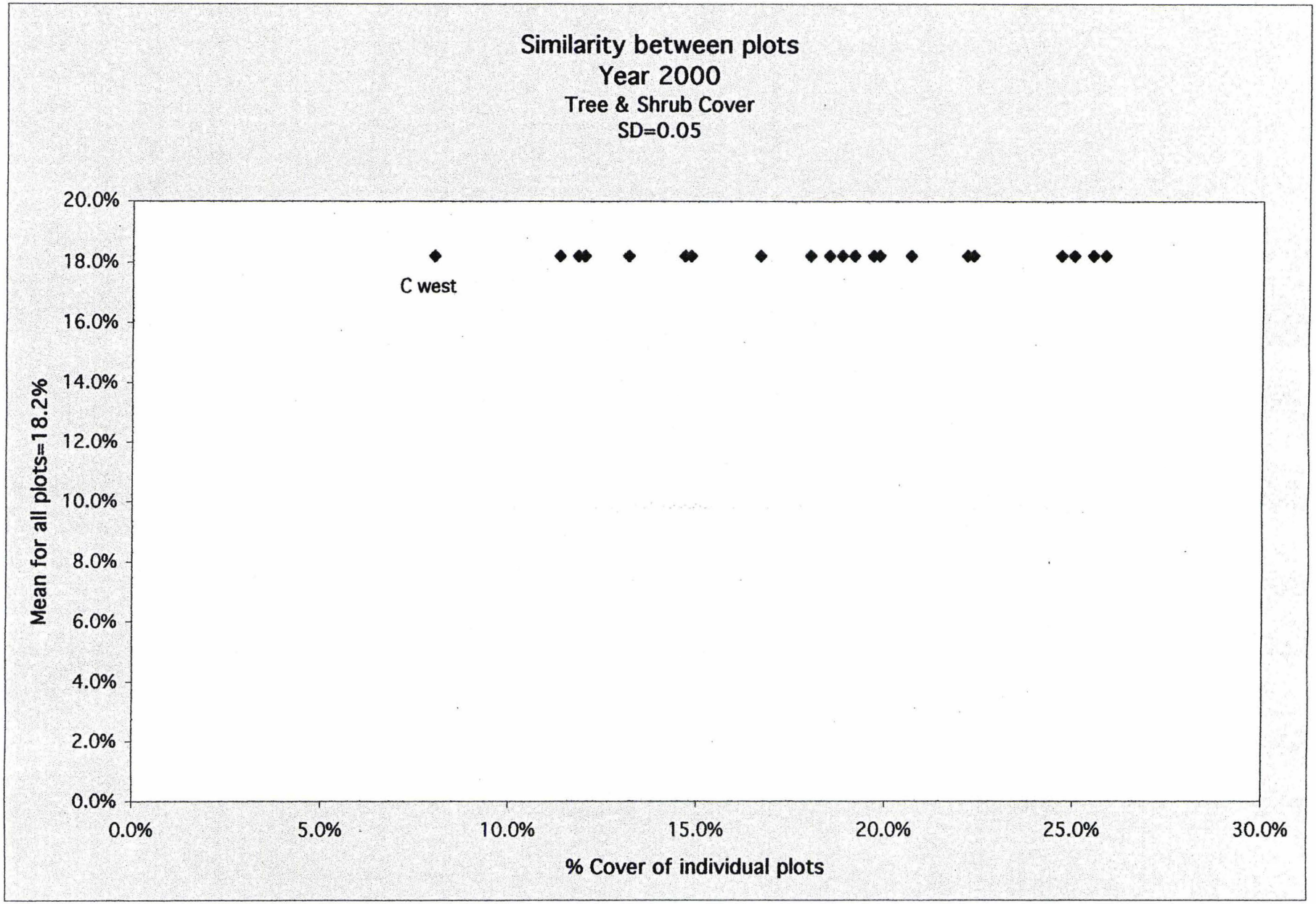
Figure 1. Two 50m x 100m plots within watershed. Transects radiate from creek bottom.

Cascabel Totals
Fall 2000

Watershed	Bare ground	Rock	Litter	Per. Gr. Basal	Per. Gr. Leaf	Per. Gr. Total	Tree & shrub c
M north	20.0%	9.3%	12.2%	10.0%	34.7%	44.7%	25.0%
M south	18.3%	9.0%	16.2%	10.3%	35.8%	46.2%	16.7%
EB north	19.7%	17.5%	12.8%	12.0%	28.7%	40.7%	12.0%
EB south	19.7%	12.0%	12.0%	8.2%	32.2%	40.3%	19.2%
K north	20.0%	13.2%	14.0%	13.5%	25.0%	38.5%	14.8%
K south	23.7%	15.5%	8.8%	8.2%	31.5%	39.7%	18.5%
F east	19.2%	10.8%	14.2%	10.5%	26.7%	37.2%	22.2%
F west	23.0%	11.7%	21.8%	10.2%	26.0%	36.2%	11.3%
G east	22.2%	12.8%	18.7%	8.7%	27.0%	35.7%	14.7%
G west	22.3%	16.3%	19.2%	9.5%	26.0%	35.5%	11.8%
C east	18.5%	18.8%	9.8%	12.3%	27.2%	39.5%	18.0%
C west	18.3%	24.5%	8.2%	13.0%	28.0%	41.0%	8.0%
N east	20.7%	10.7%	17.7%	9.2%	26.3%	35.5%	18.8%
N west	20.5%	9.8%	16.5%	12.3%	27.0%	39.3%	20.7%
D east	27.7%	16.8%	9.5%	10.0%	24.3%	34.3%	14.8%
D west	16.8%	14.2%	14.0%	12.3%	27.2%	39.5%	14.7%
I north	16.8%	17.3%	11.0%	10.8%	28.5%	39.3%	19.8%
I south	20.2%	14.8%	13.7%	9.2%	29.8%	39.0%	19.7%
J2 north	24.8%	15.3%	9.7%	12.5%	29.7%	42.2%	13.2%
J2 south	22.3%	11.2%	10.0%	12.2%	28.0%	40.2%	24.7%
B east	12.5%	18.3%	13.3%	10.0%	28.5%	38.5%	25.0%
B west	8.2%	12.5%	7.8%	16.5%	37.3%	53.8%	25.8%
H south	28.2%	22.7%	14.2%	4.3%	10.3%	14.7%	22.3%
H north	21.5%	21.2%	11.7%	7.0%	13.8%	20.8%	25.5%
Mean	0.202	0.148	0.132	0.105	0.275	0.380	0.182
SD	0.042	0.037	0.037	0.025	0.058	0.075	0.051
SE	0.009	0.008	0.008	0.005	0.012	0.015	0.010
CI 95%	0.018	0.016	0.016	0.010	0.024	0.032	0.022


Similarity between plots
year 2000
perennial grass total cover
SD=0.075
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
Mean for all plots=38%
H south
H north
B west
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
% Cover of individual plots


Similarity between plots
Year 2000
Total bare ground cover
SD=0.042
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Mean for all plots = 20%
B west
B east
H south
D east
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
% Cover of individual plots


Similarity between plots
Year 2000
Tree & Shrub Cover
SD=0.05
C west
Mean for all plots=18.2%
% Cover of individual plots
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%

W-A west
4/29/00

Cover	0m	20m	40m	60m	80m	100m	Total Co
Soil	11	8	7	10	7	4	7.8%
Rock	12	13	19	8	17	3	12.0%
Forb	3	6	5	2	0	3	3.2%
Litter	12	8	8	7	12	7	9.0%
SCCI bas.	6	3	2	2	6	2	3.5%
" leaf	11	15	13	17	13	13	13.7%
BOHI	1	0	1	2	1	0	0.8%
" leaf	0	1	1	4	0	1	1.2%
BORAD	4	4	5	8	3	0	4.0%
" leaf	7	12	8	13	6	4	8.3%
BOCU	1	0	3	0	0	4	1.3%
" leaf	2	5	4	4	2	12	4.8%
MUEM	2	3	1	1	2	3	2.0%
" leaf	4	3	0	0	2	6	2.5%
ERIN	0	0	0	1	0	1	0.3%
" leaf	2	0	1	3	4	5	2.5%
Bromus	0	2	3	3	2	1	1.8%
" leaf	2	3	5	5	2	3	3.3%
BOBA	0	0	0	0	0	1	0.2%
" leaf	0	0	0	0	0	3	0.5%
NOMI	3	12	5	4	9	11	7.3%
Grass	16	14	21	9	13	12	14.2%
Quercus	2	0	17	11	4	12	7.7%
JUDE	3	0	0	3	6	2	2.3%
Manzanit.	2	0	1	0	2	4	1.5%

Agave	3	0	0	1	0	0 0.7%

W-A east
4/29/00

Cover	0m	20m	40m	60m	80m	100m	Total Co
Soil	17	7	13	9	15	10	11.8%
Rock	19	19	25	13	17	15	18.0%
Forb	2	1	1	1	0	0	0.8%
Litter	12	9	10	11	14	20	12.7%
SCCI bas	1	3	4	2	1	1	2.0%
" leaf	6	13	10	9	5	7	8.3%
BOHI	0	0	0	0	1	0	0.2%
" leaf	1	1	5	4	1	1	2.2%
BORAD	1	3	2	2	3	2	2.2%
" leaf	7	5	4	3	7	3	4.8%
LYPH	0	0	0	0	1	0	0.2%
" leaf	0	1	2	0	1	1	0.8%
BOCU	0	0	0	0	1	0	0.2%
" leaf	1	2	0	1	0	3	1.2%
MUEM	1	4	5	1	4	3	3.0%
" leaf	5	3	4	2	5	6	4.2%
BOGR	0	0	0	0	0	0	0.0%
" leaf	0	0	0	0	0	0	0.0%
ERIN	0	0	0	3	0	1	0.7%
" leaf	0	0	3	5	4	7	3.2%
ARIST	0	0	0	0	0	0	0.0%
" leaf	0	0	1	0	0	0	0.2%
Bromus	0	2	1	0	4	1	1.3%
" leaf	3	5	3	4	3	2	3.3%
BOBA	0	0	0	0	0	0	0.0%

" leaf	0	2	0	0	0	0	0.3%
Quercus	4	21	11	16	9	12	12.2%
NOMI	10	3	3	4	11	6	6.2%
Manzanit	11	0	0	12	0	4	4.5%
Grass	12	15	16	22	17	7	14.8%
JUDE	0	4	0	0	0	0	0.7%
Agave	0	0	2	0	0	1	0.5%
MIBI	0	0	0	0	0	2	0.3%
							120.7%